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DEMAND FOR AND VALUE OF OUTDOOR RECREATION IN THE SALT-VERDE BASIN OF ARIZONA

by

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and

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and

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ABSTRACT

With the passage of the Multiple Use Sustained Yield Act of 1960, the U.S. Forest Service was to administer the National Forest Lands for purposes of producing outdoor recreation, grazing, timber, water, and wildlife in combinations that best meet the needs of the American people. For the Forest Service to efficiently administer these Lands as outlined by the above Act, the values of the products produced on these lands must be known. Values for all products except outdoor recreation have been either directly or indirectly estimated for the Salt-Verde Basin in other studies. This research develops demand functions for outdoor recreation and determines the value of the resource in recreational use.

There is a problem in quantifying the benefits that accrue from the recreational resource because most outdoor recreation on Forest Lands has no conventional market price. By following the tenet that economic values are measured by what people are willing to sacrifice in order to obtain a good or service, an outdoor recreation experience can be valued by measuring the willingness on the part of a recreator to give up all or part of his income and/or time, that is to incur a cost, in order to enjoy an outdoor recreation experience.

In this study, the modifications of method introduced by Brown and Nawas to the Clawson-Hotelling procedure for estimating recreation values are employed. Additional modifications and alterations are made when these changes bring about improvements in the results.

Every site within the eight million acre area of the Basin could not be studied. Instead, the concept of the "representative site" was used. Each representative outdoor recreation site was viewed as a stand-in for a similar site within the Basin. Five sites were selected with a variety of vegetative type, recreational activities and location relative to major population centers.

Questionnaires were mailed to over 5,000 households who visited the selected representative recreation sites in order to determine their socioeconomic characteristics, attitudes, participation rates, and variable costs of undertaking the recreation trips during the 1972 outdoor recreation season.

In order to accomplish the basic objective of determining values for the several representative sites, it was assumed that the user costs associated with a recreation activity provide a valid substitute for the price of a recreational experience. Traditional demand theory can be applied to outdoor recreation by defining demand as the amount of recreational activity that will be taken by households at various levels of user expenditures. This demand function can be expressed by a statistical demand estimate from which a second demand curve is developed, expressing the quantity taken versus posited "additional costs."

The resulting second-stage demand estimates are used to generate resource values by both the consumer surplus and nondiscriminating monopolist methods.

Higher net values and larger expenditures are associated with sites that have water-based recreation, a fair amount of development at

the sites, fairly easy access, and are more than just a few hours drive from a major population center.

Nondiscriminating monopolist values tend to be smaller than the variable expenditures for sites where travel and other expenses are relatively minor. Nondiscriminating monopolist values are higher than variable expenditures for sites that are more distant from most households' places of residence, and therefore involve greater travel costs, and for sites having water-based recreation available.

When the values of the representative sites are expanded to all sites in the Basin, the resulting aggregate values compare favorably with estimates developed by authors using an aggregate rather than a representative site approach.

CHAPTER I

INTRODUCTION

In Arizona, as is true throughout our nation, the demand for outdoor recreation has increased substantially. With population expected to grow at twice the rate as the rest of the nation, Arizona will experience expanded demand (Arizona Outdoor Recreation Coordinating Commission, 1967). In addition to population growth, increases in leisure time, per capita income, and consumer mobility, and changes in tastes and preferences have contributed to this upsurge in outdoor recreation.

Much of the outdoor recreation in Arizona occurs on publicly owned land and water resources. Because recreation on public lands has no conventional market price, there is a problem in quantifying the benefits that accrue from the recreational resource. In the absence of market pricing to guide and direct the allocation of resources, it is difficult to allocate efficiently these natural resources among their alternative uses. Each alternative use has its own associated resource value. If decisions relative to resource allocation are not to be totally arbitrary, resource values should be estimated for all types of uses as inputs to the decision process.

Until recently, many planners and administrators have been unwilling to include measures of the monetary value of outdoor recreation in the management decisions that affect resource use. They felt that

recreation value defies any type of measurement and is, therefore, priceless. However, the issue when dealing with outdoor recreation is not one of an absence of monetary values but rather one of measurement. The mere nonexistence of ready made market prices does not preclude the fact that values for this type of resource do exist.

Economic values are measured by what people are willing to sacrifice in order to obtain a good or a service, therefore, a relevant measure of an outdoor recreational value is simply the willingness on the part of a consumer to give up all or part of his income and/or time, that is to incur a cost, in order to enjoy an outdoor recreation experience. This measure of value is conceptually the same as that for other economic goods. The method of valuing an outdoor recreation experience based on the notion that the value of the experience is reflected in the cost of consuming that experience is consistent with the methods used for valuing resources associated with market-priced goods, except that outdoor recreation goods lack a formal market determined price.

Consumers of any economic good or service must receive satisfaction (utility) that is at least equal to the cost that they are willing to incur, otherwise they would not be acting rationally in incurring this cost. With a market-priced commodity, the price that is paid in the market, along with the time involved in purchasing that product (other factors such as income being constant), regulates the amount that is consumed of that product. A consumer attempting to maximize his utility would purchase that quantity of a product so that the price that he pays and the time that he spends is equal to the amount of utility added by the acquisition of that marginal unit. Likewise, an

individual engaging in some form of outdoor recreation will consume that quantity of this type of activity so that the money cost and the time cost of consuming that activity is equal to the value of the utility added by consuming that marginal unit (Wennergren, 1964).

Research Objective

It is the objective of this study to investigate the demand for and the value of outdoor recreation in the Salt-Verde Basin of Arizona. This Basin constitutes eight million acres of land whose vegetation ranges from lower elevation shrubs to the higher elevation ponderosa pines, and therefore offers Arizonans a wide variety of outdoor recreation opportunities. The popularity of this Basin is not only due to the variety of outdoor recreation activities that are available, but also because of the basin's proximity to two of Arizona's largest metropolitan centers, Phoenix and Tucson (Figure 1).

The U.S. Forest Service, with the passage of the Multiple Use Sustained Yield Act of 1960, was given the task of administering the National Forest Lands for purposes of producing outdoor recreation, range lands, timber, water and wildlife in combinations that best meet the needs of the American people. In order for the U.S. Forest Service to efficiently administer the Salt-Verde Basin as outlined in the Multiple Use Sustained Yield Act of 1960, it is essential that they know the values of the products that are produced by these Forest Lands.

Where such a multiple product situation exists on a given resource base, the economic problem becomes one of maximizing the value of product-output relative to a given cost. In economic terminology,

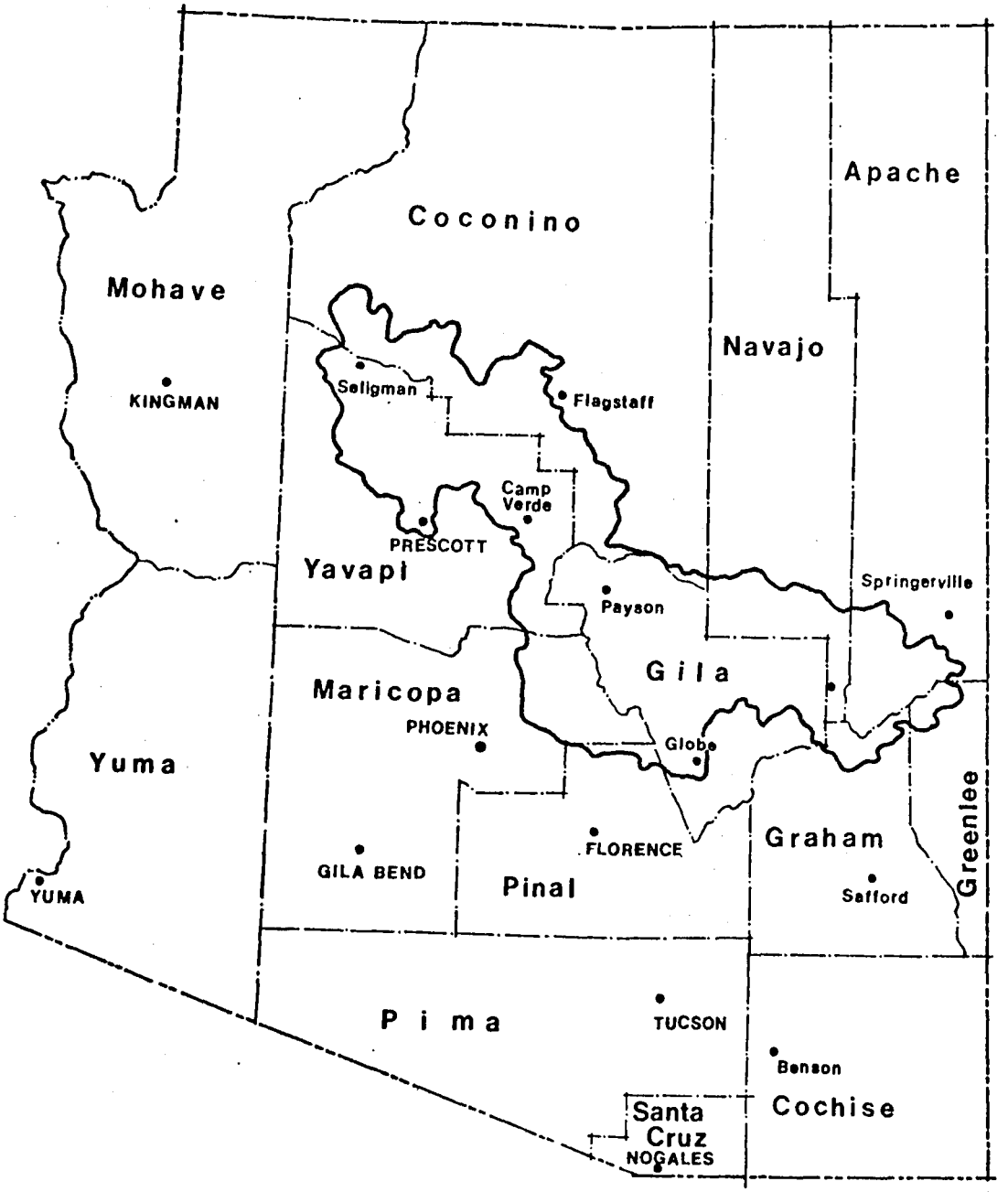


Figure 1. Map of Arizona with an Outline of the Study Area.

the product-product relationship must be solved (Heady, 1961). In doing so, the following must be accomplished: (1) the technical substitution relationships between products must be specified at all levels of output of each, (2) the relevant demand functions for each product must be specified, and (3) using information from 1 and 2 above, a solution must be obtained for the optimum combination of products to produce. Obviously, this optimum combination of products will change if the relative prices of any two products change.

The relevant technical transformation functions for products of the Salt-Verde Basin are being estimated by the Rocky Mountain Forest and Range Experiment Station (O'Connell, 1972). Demand functions for all products except outdoor recreation have been either directly or indirectly estimated. It is, therefore, the task of this research to develop demand functions for outdoor recreation and to determine the value of the resource in recreational use.

The procedures used in this study attempt to measure individual willingness to pay for alternative quantities of an outdoor recreation activity at several representative outdoor recreation sites; that is, demand functions for the use of these representative sites are developed. These functions relate the willingness to pay for alternative quantities of an outdoor recreation activity to the estimated value of the site resource. While the demand functions and estimated values are for only a few representative sites, an attempt will be made to set these estimated values within the framework of the recreational use of the entire Salt-Verde Basin.

To accomplish the aforementioned objectives, the general Clawson-Hotelling approach to outdoor recreation demand analysis will be used (Clawson, 1959; Land and Recreational Planning Division, 1949), along with appropriate statistical methods and conceptual modifications.

CHAPTER II

THEORETICAL FRAMEWORK AND REVIEW OF APPLIED RESEARCH ON THE DEMAND FOR AND VALUE OF OUTDOOR RECREATION

It is assumed in this study, and it has been a basic premise in most outdoor recreation studies, that conventional economic theory is as applicable to outdoor recreational activities as it is to other economic goods and services. The purpose of this chapter is to discuss the basic principles of demand theory and their application to the analysis of outdoor recreation, and to review previous economic research on outdoor recreation relevant to the objectives of this investigation.

Demand

In general, a demand curve for a specific commodity relates the alternative quantities of that commodity that would be purchased to alternative market prices at a given point in time, other demand factors remaining constant. The basic principle of demand is that the quantity demanded varies inversely with the price. At a high price, a relatively small quantity will be demanded. At a lower price, more of the commodity will be taken. A typical linear demand curve would look as shown in Figure 2.

If all other factors are held constant, a change in price for commodity "A" would cause a change in the quantity of commodity "A" demanded as described by the demand curve in Figure 2. Changes in factors other than the price of the commodity in question may cause a

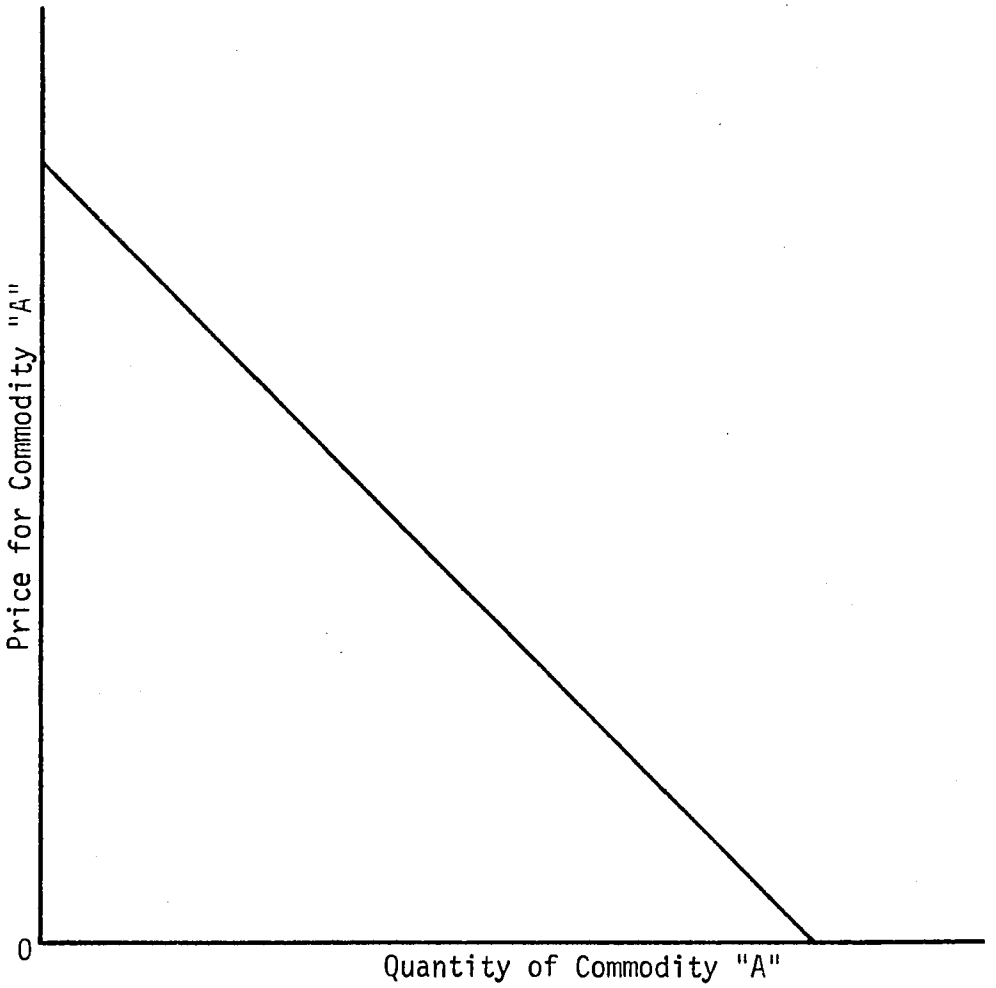


Figure 2. Typical Linear Demand Curve (Hypothetical).

complete shift in the demand curve either to the right or left of the current demand curve. A shift to the right of the current position of the demand curve would indicate an increase in demand. Economic theory tells us that demand shifters are changes in per capita income, consumer tastes and preferences, population, the prices of related goods, consumer expectations and the range of goods in the market (Leftwich, 1973).

Elements of Recreation Demand

The demand for outdoor recreation, contrary to much of the early thought, is merely a modification of conventional consumer demand. The relationship between price and quantity remains the same. The difference and difficulty arises when defining the two variables, price and volume of outdoor recreation.

First, the quantity or volume of outdoor recreation that is consumed at some particular point in time must be defined. Standard practice has been to measure the use of recreation sites by such things as visitor-days, user-days, activity-days, trips or visits. But this concept of the use of a recreation site is only one part of what Clawson refers to as the "whole recreation experience" (Clawson and Knetsch, 1966). According to Clawson, the whole recreation experience includes anticipation and preparation for the trip, travel to the site, the actual on-site experience, travel back from the site, and recollection of the experience. Clawson maintains that all five phases are present in every major outdoor recreation activity. Thus, when measuring the value of an outdoor recreation site, one must consider the fact that the whole recreation experience includes more than just the experience at the site.

This difficulty introduces the need for a two-stage evaluation procedure to be explained below.

The other basic component of any demand function is the cost of the good or service to the consumer. Normally, this cost is taken to be the market price. It is at this point that a major difference between the demand for recreation and ordinary consumer demand emerges. In the conventional type of demand, the price of the commodity is established by a functioning market mechanism wherein the equilibrium price occurs at the point where supply is equated with demand. In contrast, most forms of outdoor recreation have no conventional market mechanism. Alternative quantities of outdoor recreation are simply not offered for sale at alternative prices. Consumer prices for outdoor recreation are either totally absent or set by administrative fiat.

Boyd Wennergren in his efforts to explore the early works of Clawson, examined the problem of pricing outdoor recreation and concluded that although outdoor recreation developed as a non-market good, it is not a free good (Wennergren, 1967b). He further asserts that there are certain time and money costs which regulate the consumption of outdoor recreation. These money costs incurred in the process of participation can be used as surrogate or substitute prices in determining demand functions for outdoor recreation.

The premise that the value of a recreation experience is reflected in the cost of consuming the experience is consistent with economic theory. Consumers of any economic commodity must receive utility from that commodity that is at least equal to the cost or price paid. If this were not the case, consumption would be irrational for anyone

attempting to maximize his utility (satisfaction) from the use of the good or service. Hence, we may conclude that the use of costs as surrogate prices is justifiable. When concerned with a conventional commodity, the price paid in the marketplace is the regulator of the amount consumed. The user of a recreational resource will consume that quantity of a given type of activity such that the money cost associated with the consumptive process is equal to the value of the utility added by consuming that marginal unit, other factors, including time required for consumption, remaining constant (Wennergren, 1967a).

A problem arises in determining which costs are to be included as the surrogate price. There are two cost-related decisions that a potential recreator must face. First, there is the long-run decision to participate in some form of outdoor recreation. This long-run decision may necessitate purchasing items of a fixed nature such as camping equipment, a recreational vehicle, or other special sporting equipment. These expenditures on items which may be used for more than one trip and in more than one time period are traditionally called fixed costs. Once these costs have been incurred, they are not affected by the decision to actually participate in a particular recreation activity. Because they are unaffected by a short-run participation decision, they, in turn, do not themselves affect the short-run decision.

The second decision that the individual must face is of a short-run nature. Here, within a given period of time, the individual must decide what form of recreation in which he will participate and at what site. In this case, the important considerations are time, travel costs, and any additional on-site costs (the costs affected by the short-run

decision to recreate). These short-run costs are the pertinent costs for the surrogate price.

Wennergren argues that the use of variable costs as the surrogate price is analogous to the short-run decisions made as described by the theory of the firm (Wennergren, 1967a). This theory shows that in the short-run, the marginal costs are a function only of the variable costs and are in no way affected by the fixed costs. The marginal costs are the decision variables which relate to how much to produce. Thus, the variable costs are the only pertinent costs involved in the estimation of demand functions for outdoor recreation in that these costs relate to the marginal decision of the quantity of recreation to take.

Applied Research in Recreation Demand and Value

Demand Estimation

In 1947, the National Park Service initiated a study designed to determine the benefits associated with the national parks. In connection with this study, Harold Hotelling in a letter to the U.S. National Park Service partially reproduced below, suggested that demand functions for outdoor recreation sites could be derived (Land and Recreational Planning Division, U.S. National Park Service, 1949, unpaged reproduction of letter).

> Let concentric zones be defined around each park so that the cost of travel to the park from all points in one of these zones is approximately constant. The persons entering the park in a year, or a suitably chosen sample of them, are to be listed according to the zone from which they come. The fact that they come means that the service of the park is at least worth the cost, and this cost can probably be estimated with fair accuracy. If we assume that the benefits are the same no matter what the distance, we have, for those living near the

> park, a consumers' surplus consisting of the differences in transportation costs. The comparison of the cost of coming from a zone with the number of people who do come from it, together with a count of the population of the zone, enables us to plot one point for each zone on a demand curve for the service of the park. By a judicious process of fitting, it should be possible to get a good enough approximation to this demand curve to provide, through integration, a measure of the consumers' surplus resulting from the availability of the park. It is this consumers' surplus (calculated by the above process with deduction for the cost of operating the park) which measures the benefits to the public in the particular year. This, of course, might be capitalized to give a capital value for the park, or the annual measure of benefit might be compared directly with the estimated annual benefits on the hypothesis that the park area was used for some alternative purpose.
>
> The problem of relations between different parks can be treated along the same lines, though in a slightly more complicated manner, provided people entering the park will be asked which other national parks they have visited that year. In place of a demand curve, we have as a result of such an inquiry, a set of demand functions. The consumer surplus still has a definite meaning, as I have shown in various published articles, and may be used to evaluate the benefits from the park system.
>
> This approach through travel costs is one of several possible modes of attack on this problem. There are also others, which should be examined, though I think the method outlined above looks the most promising.

Hotelling advances the notion of defining concentric zones around a recreation site in such a way that the cost of travel to this site from all points in one of these zones is approximately constant. Travel costs from each distance zone become a proxy for the price variable which can be related to the number of recreationists from each zone to derive a demand function for the recreation site.

The ideas put forth by Hotelling were the basis for the surge of interest in outdoor recreation economics that manifested itself since that time. Expanding on Hotelling's ideas, Marion Clawson was the first to actually derive demand curves and monetary values for outdoor

recreation (Clawson, 1959). He developed a two-step procedure for estimating the demand for any outdoor recreation experience. The first step involves regressing the costs associated with the mileage recreationists traveled to a site against the number of visits per capita they took to that site from various distance zones. Clawson argues that the resulting statistical demand curve represents the demand for the total five-part recreation experience. Then the demand curve for the recreation resource itself (i.e., the site) is derived from the statistical demand function by relating posited added costs (e.g., alternative levels of entrance fees) to the total number of visits made to the site.

The basic data needed under the Clawson approach in order to derive the demand for the whole recreation experience are listed in Table 1. The costs from a particular zone to the recreation site are assumed to be the same for every visitor within that zone. The number of visits is put on the basis of per 1,000 population from the zone of origin. This is done in order to remove the differences in population from one zone to another. By plotting costs from column (3) against the corresponding number of visits per thousand population in column (5), a demand curve for the total recreation experience can be determined and is depicted in Figure 3.

The second step in the analysis is that of developing a demand curve for the resource site itself. This demand curve is derived from the demand curve for the recreation experience based on the assumption that the resource users would react to changes in costs at the site (e.g., an entry fee) in the same manner to which they react to changes in costs for the recreation experience as a whole. In developing the

Table 1. Prices and Quantities for Statistical Demand for Recreation (Hypothetical).

Zone	Population of Zone (2)	Cost from Zone to Recreation Area (3)	Number of Visits (4)	Visits per 1,000 population (5)
1	1,000	$1.00	500	500/1,000
2	4,000	3.00	1,200	300/1,000
3	10,000	5.00	1,000	100/1,000
			2,700	

Source: Clawson and Knetsch [1966].

Table 2. Values for Total Quantity of Visits and Added Costs (Hypothetical).

Zone	Number of Visits at Added Cost Per Unit					
	0	$1.00	$2.00	$3.00	$4.00	$5.00
1	500	400	300	200	100	0
2	1,200	800	400	0	0	0
3	1,000	0	0	0	0	0
Total Visits	2,700	1,200	700	200	100	0
Total Revenue Generated	0	$1,200	$1,400	$600	$400	0

Source: Clawson and Knetsch [1966].

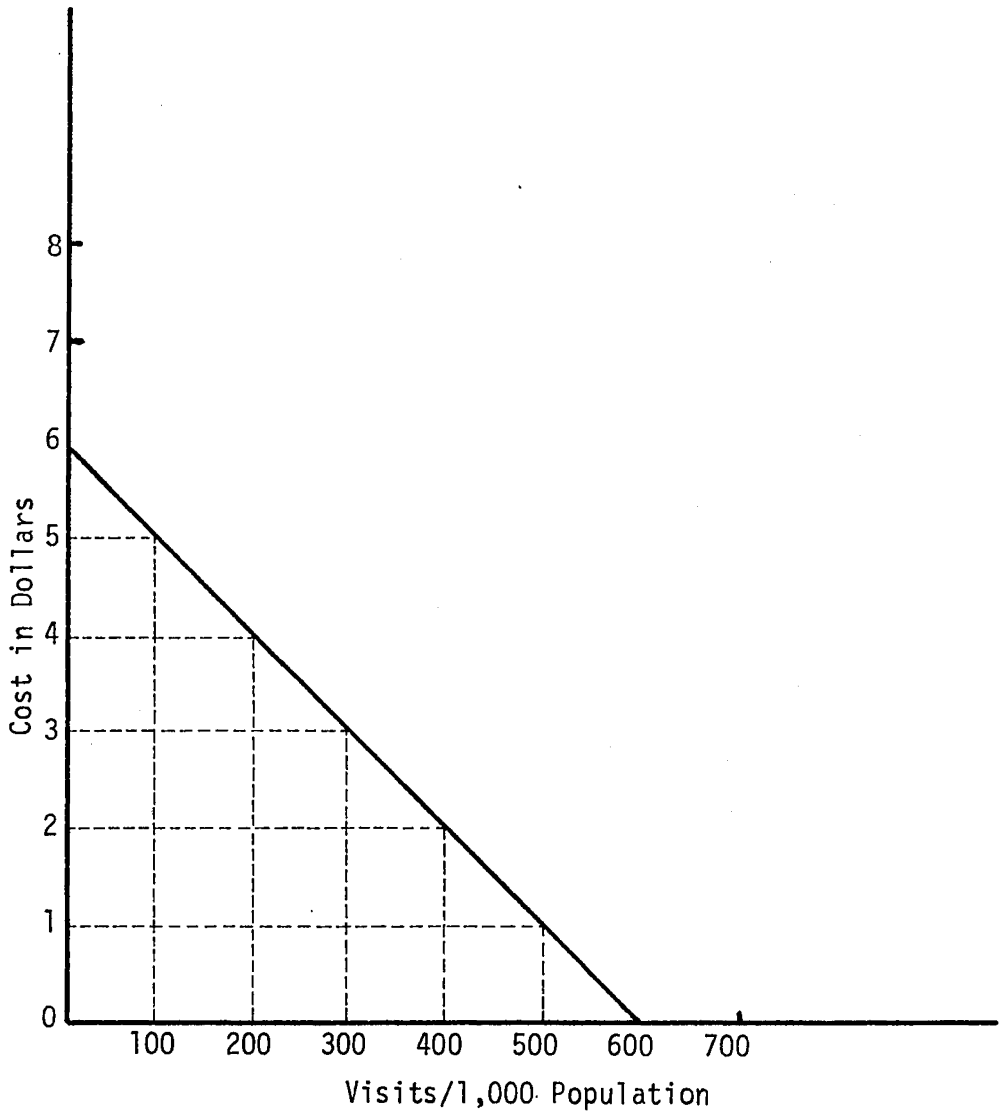


Figure 3. Demand Curve for the Total Recreation Experience (Hypothetical).

Source: Clawson and Knetsch [1966].

demand curve for the resource, the total projected number of visits is calculated at each posited increased interval of cost. The resulting demand curve is in terms of added costs and total quantities of visitation.

The following example will clarify the notion of developing the demand curve for the resource. The total quantity of visits at the existing prices was 2,700 as shown in Table 1. By adding increments of one dollar to each original price, the corresponding quantity of visits can be determined in the following manner:

> At the $1 added cost per visit from distance zone 1, the number of visits per 1,000 population is determined from Figure 2 to be 400. In essence, at a cost of $2/visit, the number of visits per 1,000 from distance zone 1 is 400. This figure is then converted to total visits at the $1 added cost in the following manner:
>
> $$\frac{400}{1{,}000} \times 1{,}000 = 400$$
>
> That is, at the $1 added cost,
>
> $$\frac{\text{visits}}{1{,}000 \text{ pop.}} \times \text{population of the distance zone} = \text{total visits}$$
>
> This same process is repeated for each distance zone. The total visits for each distance zone at the $1 added cost per visit are summed to establish one point on the demand curve for the resource itself.

This procedure is repeated for different added costs to arrive at a schedule as shown in Table 2. The points of added cost and total visits as shown in Figure 4, are points on the demand curve for the resource itself. It is this demand curve for the resource that is used to evaluate the resource itself.

In the Clawson study, zone differences with respect to the distribution of income and other socioeconomic variables were not included.

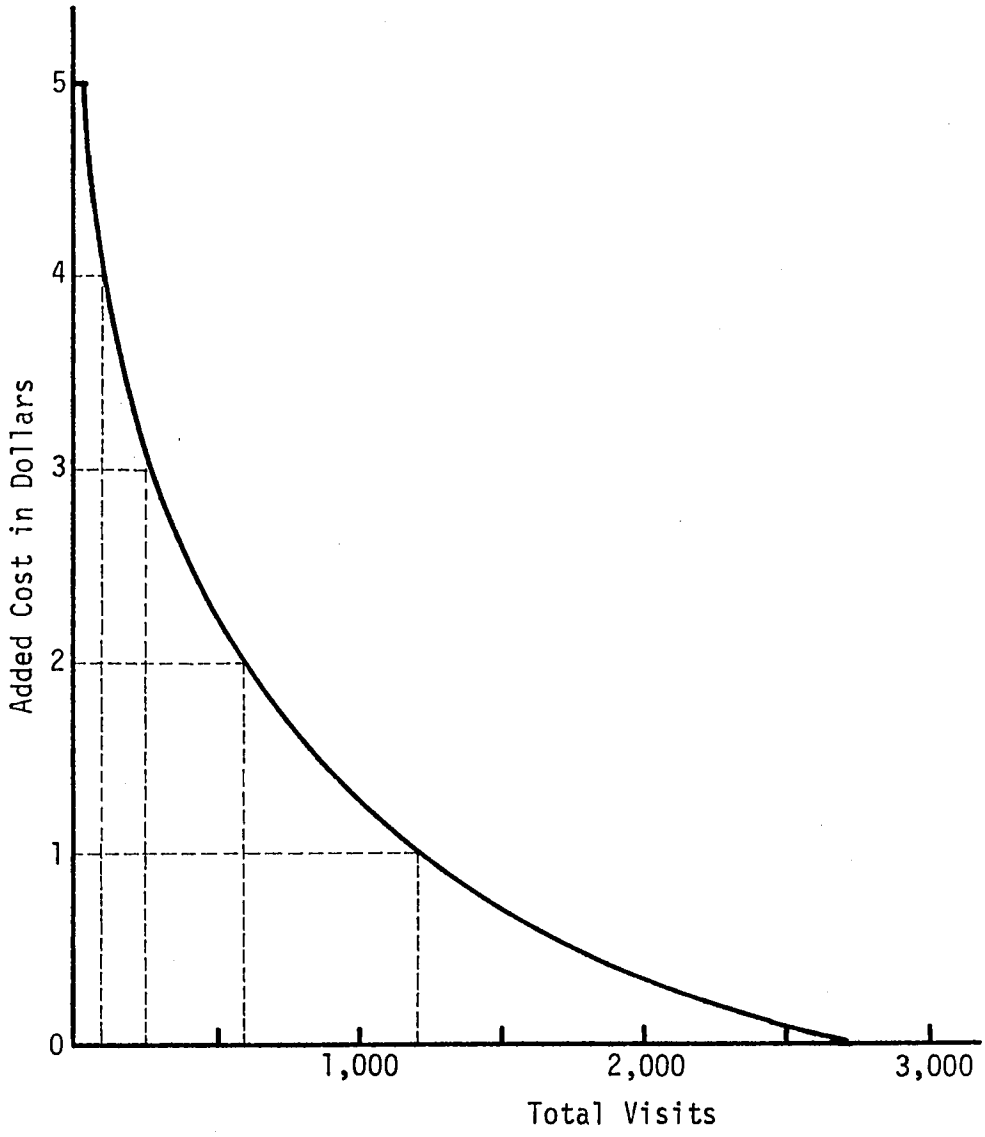


Figure 4. Demand Curve for the Resource (Hypothetical).

Source: Clawson and Knetsch [1966].

In addition, the time factor for travel and carrying on the activity was omitted except to the extent that it was directly related to a distance zone. Neglecting travel time in the analysis assumes a completely elastic supply of time function to the recreator. This is not a crucial assumption when the distance from place of origin to site is minimal. When considering points of origin that are more distant from the site, then a response of demand for the site, given a change in entry fees, would be less if time were considered. Neglecting travel time would shift the demand curve for the total recreation experience to the left as the cost of the trip increases. "However, in addition to the complication of travel time, distance can be expected to shift the demand curve to the left for another reason. The greater the distance zone is from a particular recreation site, the greater are the number and appeal of available substitutes for that particular site, because other sites become relatively cheaper in time and money" (Brown, Singh, and Castle, 1964, p. 9). These observations suggest that it would be desirable to take account of distance explicitly, rather than indirectly, in order to improve the accuracy of projections.

Knetsch also makes the observation that the time constraint in the Clawson study distorts the relationship between money costs and the number of visits and thereby consistently biases the true demand curve to the left (Knetsch, 1963).

A refinement of the Clawson method was presented in the study of the Oregon salmon and steelhead sport fishery by Brown, Singh, and Castle (1964). The authors developed an elaborate sampling and interview technique to determine average expenditures incurred by fishermen for durable

equipment and current expenses that applied to the decisions to recreate. Five main distance zones were set up based primarily on average distance traveled for salmon-steelhead angling. The average variable costs, when combined with the number of days taken per angler family for each of the five distance zones comprised the demand relationship. The resultant demand curve corresponded to what Clawson (1959) calls the demand "for the recreation experience as a whole." A second demand function was developed in the Clawson tradition to relate the number of angler days to increased fees at the site.

The authors also attempted to examine the effects of other variables such as income and distance on the number of fishing days per capita taken by anglers. They further subdivided angler families in the five main distance zones into income level groups within the distance zones. Least-squares regression indicated that income exerted a significant influence on per capita angler days taken. Average distance per main distance zone was not statistically significant because the authors were not able to separate out the effect of the money cost of distance and the time cost.

In the study undertaken by Boyet and Tolley (1966), two methods for estimating demand functions were formulated. The first method, while rooted in the Clawson tradition, abandons the visits per capita style of research in favor of a multiple relationship that includes an area's total population. Recreators are classified according to their state of origin rather than concentric distance zones. It was felt that data classified by states was comparable to time series data for estimating demand functions, where states are similar to years and distance is

analogous to prices paid. In estimating demand functions by regression techniques they included such demand shifter variables as population, per capita income and distance.

The second method of measuring and projecting recreational demand was based on characteristics of individual users of a recreation area. This approach, they felt, is analogous to a cross-section analysis of demand explaining differences in behavior in terms of individuals' characteristics. Recreationists were classified according to three characteristics: distance of their residence from the recreation site, family income, and paid vacation time. Rates of visitation from each distance-income-vacation class were then estimated and used in determining demand functions. This method allowed the distribution of income and other socioeconomic variables to have a greater influence on demand than if only the average of these variables were utilized.

Although in many respects this model improved projections, it did involve rather unique assumptions. It assumed that all persons of a particular subgroup had similar demand patterns. It also assumed that the rate of participation in each activity per subgroup remained the same in the future.

A further improvement in methodology was presented by Brown and Nawas (1971), whereby a method was developed that utilized individual observations to estimate statistical demand functions. In the past most researchers had worked with average trips per capita from a given area of origin to a recreation site when computing the quantity variable. The old form of the variable is computed by summing all the trips from that

origin and dividing that sum by the total population. The resulting answer is then adjusted by the sampling rate.

Brown and Nawas (1973) show that it is possible to improve the efficiency of the least squares estimators significantly by using individual observations instead of area averages. The new quantity variable is simply a measure of the participation of each individual at the given site. Results for individuals are expanded relative to the sampling rate in each area of origin. The number of observations in the regression analysis is increased by a factor of n for each area of origin (where n is the number in the sample at that origin) and the variance of the resulting estimators will be significantly reduced from that obtained by using the old averaging procedure.

The authors indicate that by using individual observations rather than the traditional zone averages, efficiency of estimation may be improved by as much as 1,000 percent. They found that as a direct result of the increased efficiency of estimation, it was possible to disentangle the separate effects of travel time and variable cost.

Davis (1964) approached the problem of estimating the demand and benefits of outdoor recreation in a somewhat different manner than has previously been described. He utilized what is referred to as the direct technique in determining the demand and benefits of big game hunting on a private forest in Maine. Benefits were defined as the total of the maximum prices that hunters would pay rather than be excluded from the hunting experience.

Davis instituted a bidding game in which hunters could react to increased costs of visiting the area. Bids were systematically raised

or lowered until the respondent switched his reaction from inclusion to exclusion or vice versa (Davis, 1964).

Demand curves were derived from the above data by arraying the responses of the willingness to pay per hunting unit and calculating downward. These data along with certain socioeconomic characteristics were subjected to multiple regression analysis. The resulting statistical demand estimates were a combination of the willingness to pay for the activity and the information found to best explain that willingness to pay arrayed according to a price-quantity relationship typical of a demand function.

Value Estimation

The value of outdoor recreation concerns governments because one of their functions is to allocate funds and resources among competing uses. Recreational activities often assume the role of collective goods and may, therefore, require public action. Due to the risks involved, private financing of recreational facilities can often be prohibitive. As a result, federal agencies have had the management of outdoor recreation practically thrust upon them.

Unless some type of value can be attached to the benefits of a proposed recreational project, and unless this value can be expressed in such a way that it can be compared with the benefits of other proposed projects, it is not likely that an optimal amount of money will be expended on outdoor recreation (Trice and Wood, 1958).

In trying to value any good or service, one immediately considers the market price of that good or service. One must recognize, though,

that the market price does not represent the total value that a good provides for an individual or for a society. Consequently, Beazley feels that the market demand value should not be used as the major criterion that governs the allocation of resources into outdoor recreation (Beazley, 1961, p. 647).

> Market demand values tend to be good indicators of resource allocation where the great majority of the benefit received is individual in character and is fully recognized by that consumer with respect to both immediate and future effect . . . Great art, education, hospitals, roads, and many other so-called 'community services' fall more or less into the same category as outdoor recreation, wherein many social values to the individual are involved, often having long term implications for the future of society.

For many years most people felt, as apparently did Beazley, that recreation was incapable of being measured because of the intangible benefits that were derived from it. However, Crutchfield (1962, p. 149) points out that this kind of reasoning "is to deny the rationale of our entire economic organization." One simply can't give up and refuse to value outdoor recreation.

An early approach to estimating values for outdoor recreation was initiated by the National Park Service whose officials ruled that "a reasonable estimate of the benefits arising from the reservoir itself may be normally considered as an amount equal to the specific costs of developing, operating, and maintaining the recommended facilities" (U.S. National Park Service, 1950, mimeograph). This oft referred to "cost" method assumes that the value of outdoor recreation resource use is equal to the cost of generating it or, in some extreme applications, to a multiple of that cost. Trice and Wood (1958) point out that nothing is gained by assuming this constant relationship between benefits and

costs since the reason for estimating benefits in the first place is to decide whether costs should be incurred at all.

A method that has commonly been used to measure the value or benefits of outdoor recreation is the gross expenditure approach. This method sets the value of recreational resources equal to the sum of all expenditures incurred by individuals participating in outdoor recreation at some specific site. The justification for using this method is that "the recreation is worth at least as much to the recreationist as he is willing to pay for it" (Seckler, 1966, p. 487). This gross expenditure value is of some use in indicating the amount of money spent on a particular type of outdoor recreation, although it must be recognized that gross expenditures include the costs for many goods and services, some of which might have been incurred had the visitor stayed home and some of which might have been made in prior years. Thus, recreation researchers feel that gross expenditures are an inadequate measure of the value of outdoor recreation. Economists simply point out that this method lacks a consistent conceptual framework.

An observation made by Trice and Wood (1958, p. 200) is that the "dollars spent in pursuit of recreation appear to be more significant as indicators of secondary benefits to the business community than as measures of primary recreational benefits." Even if used to measure secondary benefits, the measure is an overstatement of recreation's importance to the business community, since it is a gross rather than a net figure.

Probably the most generally approved method for estimating the value of outdoor recreation is to approximate the consumer surplus

implied by an estimated recreation demand function. This surplus concept was defined by Marshall (1948, p. 124) in the following manner:

> We have already seen that the price which a person pays for a thing can never exceed, and seldom comes up to that which he would be willing to pay rather than go without it; so that the satisfaction which he gets from its purchase generally exceeds that which he gives up in paying away its price; and he thus receives from the purchase a surplus of satisfaction the excess of the price which he would be willing to pay rather than go without the thing, over that which he actually does pay, is the economic measure of this surplus satisfaction. It may be called 'consumer surplus'.

Marshall assumed the marginal utility for money to be constant so that the price of the commodity can be used is a measure of utility. The central idea behind consumer surplus is that the consumer has in his mind a price that he would be willing to pay rather than to go without a certain commodity. The price that the person is willing to pay is usually greater than the price he does pay. Since price is a measure of utility, the difference in price that the individual is willing to pay and the price that he does pay is a measure of surplus satisfaction. It also represents the monetary savings to the individual at the given market price, and can be represented graphically by the shaded portion in Figure 5 as the area under the demand curve that is above the price (P_o) at which the commodity is being sold.

Mathematically, consumer surplus can be determined by evaluating the integral under the demand curve up to the quantity (Q_o) that is being sold, and subtracting out the total cost (P_oQ_o) that is actually being paid.

Wennergren (1967b), in his deer hunting study, defines the second-stage demand curve as developed for Figure 4 as the quantitative

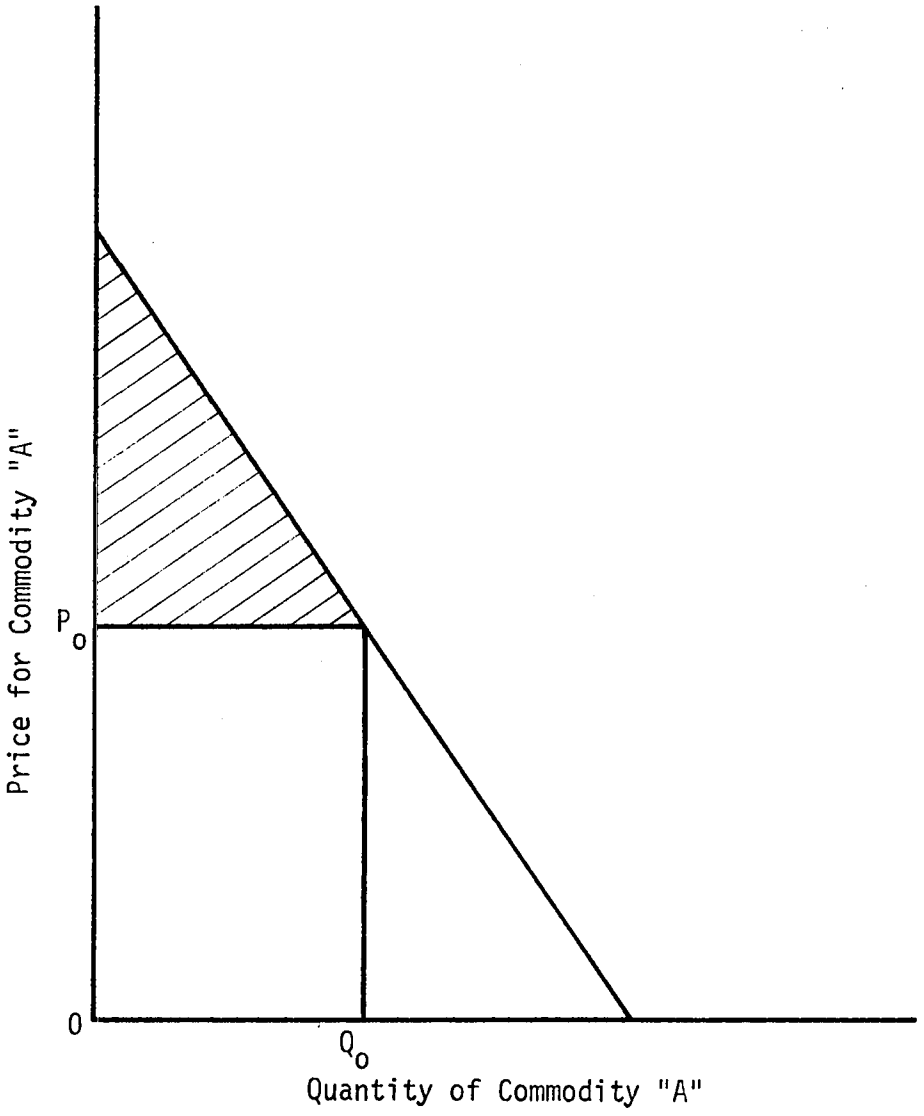


Figure 5. Relationship of Consumers' Surplus to Demand.

estimate of the value of the marginal utility generated by the resource when recreationists equate the value of marginal utility with marginal cost. All the hunting visits except the marginal visit were worth more in terms of utility than their associated costs. Thus, the surplus satisfaction that was derived from all the visits except the marginal visit represents the net economic value generated by the resource and is measured by the area under the demand curve. While the magnitude of this value may be expressed in monetary terms, this value is not involved in exchange and, therefore, does not necessarily influence the economic activity of a region that includes this resource. Wennergren (1967b) points out that the estimated value of the resource is a monetary expression of the worth extracted by recreators from a recreation experience, over their cost of participation. He emphatically concludes that "the worth of the resource is not extracted in monetary units, it is only expressed in such units" (Wennergren, 1967b, p. 15).

The alternative valuation method commonly used by economic researchers with the two-stage Clawson-Hotelling procedure to value outdoor recreation is the nondiscriminating monopolist method. Brown, Singh, and Castle (1964, p. 28) defined the net economic value of sport fishing as "the estimated value of the sport fishery to a single owner who could charge for the opportunity of fishing." A rational monopolistic owner of a resource would want to maximize the total revenue obtained from the use of the resource. To do so, he must select a single optimum price to charge for the product of that resource, since he cannot discriminate between consumers relative to price. (Total discrimination would achieve the same value for total revenue as the consumer surplus

value.) The price to charge in order to maximize total revenue corresponds to the point of unitary elasticity on the demand curve. The revenue estimate reflects that portion of consumer surplus which could be extracted by monopoly pricing. Unitary elasticity on the demand curve simply defines that point where price times quantity is maximized. Figure 6 shows the relationship between demand, marginal revenue and maximum total revenue at unitary elasticity for a simple linear demand function. The shaded area (P_0Q_0) is the value of the resource to its users or as Brown describes it, "the net economic value of the resource" (Brown, Singh, and Castle, 1964, p. 28).

For example, referring back to Figure 4 and Table 2, estimates of total visits taken by all origins at alternative incremental costs were calculated. When these total visit estimates are multiplied by their corresponding incremental cost, alternative total revenues are derived (see the last row of Table 2). Total revenue is maximized at $2.00 added cost, since $1,400 is the highest total revenue that can be gained by a nondiscriminating monopolist given the underlying demand relationship (assuming discrete increments of $1 each).

Certain assumptions are essential for evaluating the resource either by the consumer surplus method or the nondiscriminating monopolist method under the two-stage Clawson-Hotelling procedure. It is assumed that: First, recreators spend their income in such a way as to maximize total derived satisfaction. Second, major decisions pertaining to the recreation trip are made prior to departure and the recreation activity at a site is the causal agent in an individual's decision to take the trip. Third, all costs are incurred solely to obtain the

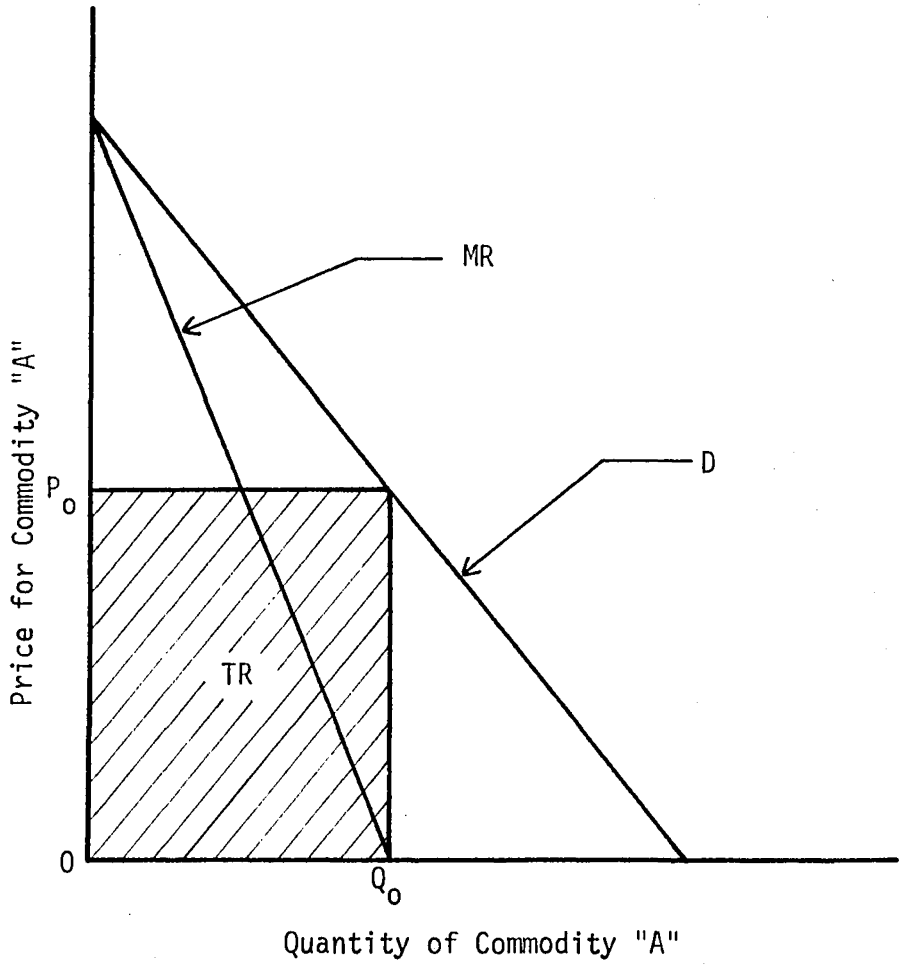


Figure 6. Relationship Between Demand, Marginal Revenue, and Total Revenue.

recreation experience. Fourth, recreators using a particular site will react to an imposed cost increase such as an entry fee in exactly the same manner as they would react to any other increase in variable costs. If the imposed incremental cost could be assessed as a use fee, this increment then represents an estimate of the revenue maximizing use fee for the site with the annual resource value being defined as the total revenue paid by the users of the site (Wennergren, 1967b).

For this study, the basic method that will be employed for estimating demand for and value fo the selected recreation sites will be based on the Clawson-Hotelling two-step procedure. The refinement introduced by Brown and Nawas of using individual observations rather than using average data will be one of the modifications introduced. Values for the recreation resource will be estimated using both the consumer surplus method and the nondiscriminating monopolist method.

CHAPTER III

RESEARCH METHODS AND PROCEDURES

The preceding chapters established the theoretical framework and the major objectives of this study. The general procedure for determining the value of the recreation resource in this study is based upon the Clawson-Hotelling two-step model (Clawson, 1959; Land and Recreational Planning Division, 1949).

Improvements, additions and alternatives to the basic Clawson-Hotelling model were made whenever possible or necessary in order to improve the results. This chapter discusses in detail the various procedures actually used in gathering the data and developing the models of this study.

Selection of Study Sites Within the Salt-Verde Basin

The study area is referred to as the Salt-Verde Basin and extends from the central part of Arizona to the New Mexico border. It is eight million acres in size and one of the primary supply areas for people pursuing outdoor recreation in Arizona. It is quite typical of Southwest river basins. The opportunities for outdoor recreation in this Basin range from camping and fishing in the pines to rock hunting in the desert. The U.S. Forest Service administers 63 percent of the total Basin and a larger proportion of the upstream watersheds.

Developed recreation sites occupy 2,276 acres of the total forest land in the Basin. Major use of these sites come from in-state residents.

It is not feasible to study each of the sites within the eight million acre Basin. Therefore, the concept of the "representative site," similar to the widely used economic concept of the "representative farm" or "representative firm" was adopted. Each representative outdoor recreation site may be viewed as a stand-in for a similar site within the Salt-Verde Basin.

The number of sites selected for study was constrained by the available time of the researcher and the size of the Forest Service grant of funds which provided the major support for this project. Due to these constraints, all types of sites may not be represented. However, an effort was made to select a variety of sites with respect to vegetative types, recreational activities and location relative to major population centers.

Five sites were selected for study. All are in relatively remote areas. All but one of the sites can be reached only by traveling on dirt roads. Access to the sites is limited. The purpose of selecting sites with limited access was to better monitor the number of visitors to the specific sites. One site from each National Forest within or abounding the Basin was chosen. The vegetation of the five sites ranges from desert shrubs to ponderosa pine. Four of the five sites have water-based recreation available. A wide range of outdoor recreation activities may be undertaken at these representative sites.

The five sites selected and the National Forest involved are as follows:

1. Brushy Basin-Four Peaks (Tonto Forest)
2. Horsethief Basin (Prescott Forest)
3. Knoll Lake (Coconino Forest)
4. Luna Lake (Apache Forest)
5. Black Canyon Lake (Sitgreaves Forest)

Locations of the sites are shown in Figure 7 and descriptions of each of the sites will be presented in the following chapter.

Data Collection

In order to develop demand relationships for particular forest sites, people who have actually visited the sites must be contacted. Therefore, if questionnaires were to be sent to recreators who had visited one of the five representative sites, it was essential to obtain the names and addresses of the visitor population.

As explained above, the sites selected are all relatively remote areas with limited access (one or two dirt roads). Only some of the sites have camping facilities for which overnight campers must pay a fee and register. Therefore, no available population list existed. In order to develop a population list at each site from which to draw a sample, voluntary registration desks were placed along each access road to each site. Registration cards placed in containers attached to the registration desks requested the name, street and town address, auto license number, ZIP code, and date of registration for one member of each visiting group. Directions for filling out the card and a simple explanation of the purpose of the study was in plain view at the registration desk. Since the decision was made to view the household as the

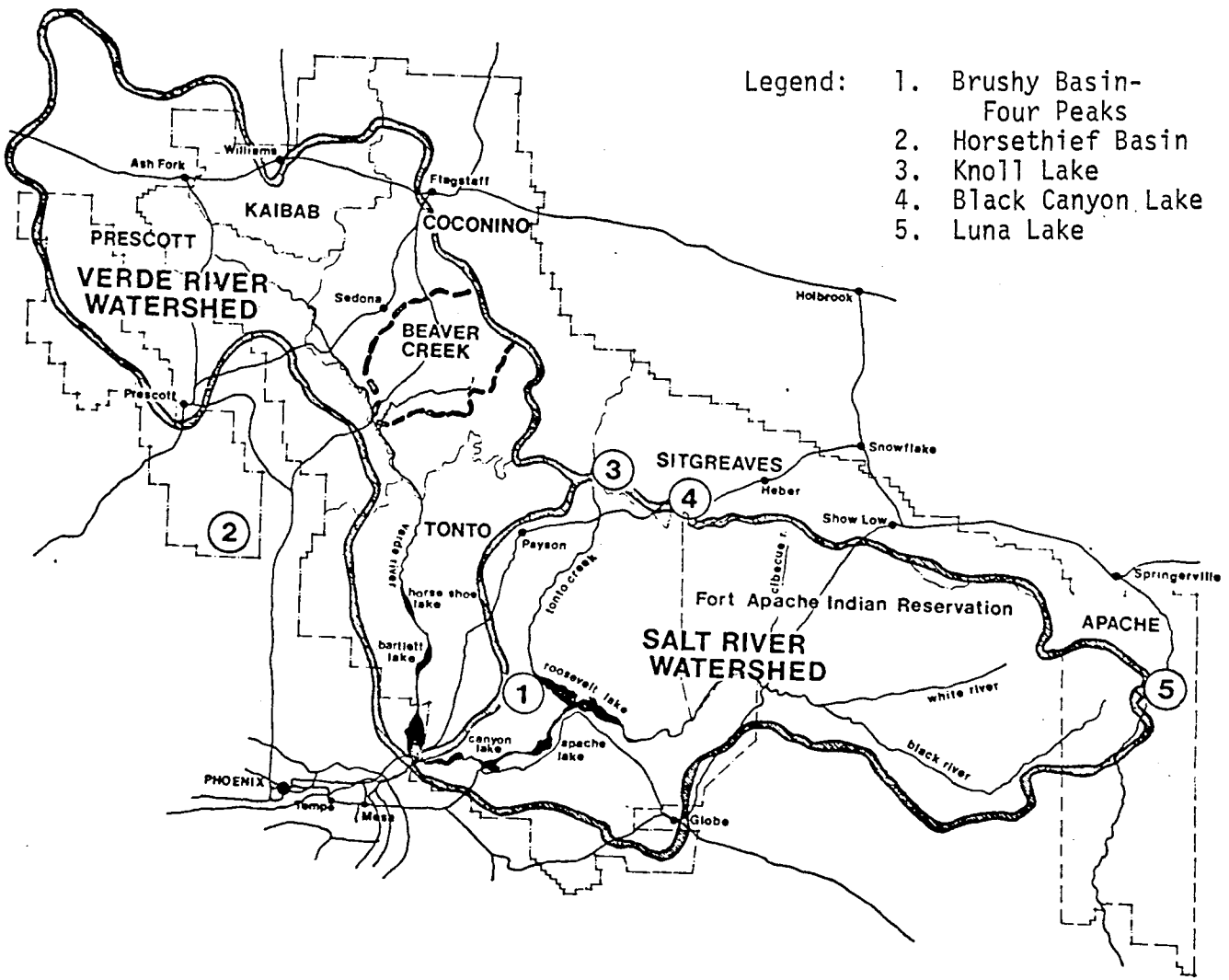


Figure 7. Outline of the Salt-Verde Watershed and Location of the Study Sites.

decision making unit, as did Gum et al. (1973), only one member of each visiting group was asked to fill out a registration card (the questionnaire inquired as to the composition of the visiting group). The completed cards were dropped into a locked container attached to the registration desk. The cooperating ranger from each district and/or the researcher collected the completed registration cards on a weekly basis. See Figure 8 for a picture of the registration desk and a sample registration card.

Upon receipt of the registration cards, a mail questionnaire, along with a self-addressed stamped envelope, was sent to the visitors of each site. The questionnaires were mailed as soon as possible after registration in order to reduce memory bias on the part of the recreator. He would receive the questionnaire while the recreation experience was still fresh in his mind. The questions related to the specific site at which the respondent registered.

One site, Brushy Basin-Four Peaks, served as the pretest for the study since the recreation season at this site is almost the entire year. In choosing this site as the pretest area, questionnaires could be sent and received prior to the opening of the recreation season for the remainder of the sites. As a result, appropriate revisions in the questionnaires and procedures were made where problems existed.

The remainder of the sites were sampled during their use season as established by the U.S. Forest Service. The season at most of the sites extends from May to October. Prior to establishing registration stations at the selected sites and sending questionnaires to registrants, it was estimated that about 20,000 individual households would visit the

UNIVERSITY OF ARIZONA
and
FOREST SERVICE
COOPERATIVE RECREATION STUDY

DATE

NAME CAR LICENSE

STREET ADDRESS

CITY STATE ZIP

Figure 8. A Registration Desk and Registration Card.

selected sites during the 1972 recreation season. Not all of these households were expected to register at the registration booths, but it was hoped that 40 to 50 percent would register. According to Table 3, 5,298 individual households registered at the five sites. The predicted estimate was not reached due to a lower rate of registration at all of the sites except Brushy Basin-Four Peaks and due to the closure of several study sites during the later part of May and early June 1972. The closure was due to forest fires and the potential danger of fires. Closure is not an unusual occurrence, almost every year the danger of forest fires and actual forest fires forces the closure of many recreation sites.

Since some of the households visited the selected sites several times during the study period and since they could register more than once at a registration booth, care was taken to note that only one questionnaire was sent to an individual household. Due to the low registration rate, questionnaires were mailed to all individual households that registered at the five selected sites rather than to a sample of registrants as was initially planned. One week after the questionnaire was mailed, a follow-up letter was sent to the registrant, the purpose of which was to thank the person for his response and to remind him that if he had not responded to do so. A sample of the follow-up letter is contained in Appendix A.

Questionnaire Design and Response of Recreators

A mail interview questionnaire was decided upon due to the large number of questionnaires to be completed for each of the five selected

Table 3. Summary of Response to Questionnaires, by Sites.

Site	Questionnaires Mailed	Questionnaires Returned[a]	Percent of Questionnaires Returned[b]	Usable Questionnaires[a]	Percent of Usable Questionnaires[b]
Luna Lake	1,134	566	49.9	451	39.8
Black Canyon Lake	854	391	45.8	360	42.2
Knoll Lake	1,456	786	54.0	662	45.5
Horsethief Basin	554	302	54.5	293	52.9
Brushy Basin-Four Peaks	1,300	650	50.0	634	48.8
Total	5,298	2,695	50.9	2,400	45.3

[a]Of the returned questionnaires, 89 percent were usable.

[b]Expressed as a percent of questionnaires mailed.

sites. The mail questionnaire method was considered to be the most efficient in terms of cost and time involved. The total cost of the questionnaires was $2,500, approximately fifty cents per questionnaire inclusive of paper, reproduction, envelopes, postage, and labor.

The questionnaire was color-coded by sections in order to attain a higher rate of response from the registrants. The same questionnaire was used for each of the five selected sites with the exception of the section that pertained to recreators' attitudes toward the specific site. The cover letter contained the name of the specific site at which the recreator registered. A copy of the questionnaire and a brief description of each section is included in the appendix.

The rate of response to the questionnaire, as shown in Table 3, ranged from a low of 45.8 percent at Black Canyon Lake to a high of 54.5 percent at Horsethief Basin. Not all of the questionnaires that were returned could be used in the analysis since some were incomplete. The rates for usable questionnaires ranged from a low of 39.8 percent at Luna Lake to a high of 52.9 percent at Horsethief Basin. These rates of return are considered extremely high when taking into account the length and complexity of the questionnaire. The high return rate may be an indication that outdoor recreationists are very much concerned with and are willing to take a real interest in the management of the recreation resource.

When using a mail survey, some quantity of non-response is to be expected. The bias introduced as a result of not measuring all of the units in the sample can be corrected by taking a random subsample of non-respondents in the subsample (Hansen and Hurwitz, 1946). This can be

accomplished by telephoning a randomly selected sample from those registrants who failed to return a questionnaire. From the subsample it can be determined whether they differ in terms of socioeconomic characteristics from the main sample. The subsample could also indicate whether those households took more or fewer trips and/or days and incurred different costs than the main sample. If the subsample differed significantly from the main sample, then adjustments could be made to correct for the bias. Since it turned out that the socioeconomic characteristics of households at all sites except Luna Lake were not stable nor significant variables in the regression equations, it was judged that the additional time and cost of contacting the nonrespondents was not justified. The coefficients on the cost and distance variables were significant and stable enabling demand estimates to be made. Since the hypothesized shifter variables were not usually significant, further data on these variables from the nonrespondents would not serve as a basis for adjusting any bias.

Definition of Variables Necessary in Constructing the Demand Curve

It is theorized in this study that the variable costs that a recreationist incurs are the major determinants of the number of trips and/or days a household participates in recreation at a site. This section is primarily concerned with determining the variables involved in constructing a demand curve for a recreationist.

The Quantity Variable

With respect to evaluating recreation demand, most of the literature defines the amount of recreation taken in terms of user days or trips per unit of population. As a result, researchers have normally worked with average trips or average days per capita from a given area to a recreation site. In addition, most of the literature has been concerned with developing information pertaining to the participation and expenditures of individuals or individual licensed sportsmen in their outdoor recreation activity. Neither approach will be adhered to in this thesis.

It is felt that the family is the decision making unit and that the household is the maningful recreation unit to observe. Therefore, rather than developing information about individuals or individual licensed sportsmen, information is developed about households. An outdoor recreation study undertaken for the Arizona Game and Fish Department revealed that the decision to recreate in a particular activity was made by individuals within a household setting (Gum, Martin, Smith, and Depping, 1973). It was found that the various interests, available time and resources of each household member within the household setting led to an individual or joint decision, either explicitly or implicitly.

The average trip per capita method for computing the quantity variable was replaced in this study by the more efficient individual observation method described by Brown and Nawas (1971) and briefly summarized in Chapter II. The quantity variable was computed in terms of household-trips and/or household-days, whichever was more applicable to the specific site in question. The number of trips or days taken in

1972 by the sample households to each specific site was requested in the questionnaires. These numbers were related to data specific to the individual household in the regression analysis. In the second stage of the analysis, the demand curve was computed for each individual household and then expanded by the appropriate sampling rate to arrive at the estimated trips or days that the aggregate of households would take at alternative additional costs.

The Price Variable

To complete the demand relationship, the price variable must be defined. This variable consists of expenditures incurred by a household while participating in an outdoor recreation activity. These are expenditures which are incurred only if the trip is made. These variable expenditures must be considered by households when planning a trip and may, therefore, determine the number of trips undertaken. Expenditures that occur whether a trip is made or not are considered "fixed" in nature and are usually on items that are usable over a long period of time and, therefore, not directly associated with a particular recreation trip or activity. As a result, they are not useful in estimating the value of the recreation resource itself. The categories that comprise the variable expenditures in this study are as follows:

Additional food and refreshment costs including liquor (only the cost of food and refreshment above that which would have been spent at home is included).

Lodging (motels, hotels, trailer courts and camp fees; excluding camping equipment, staying with friends or relatives, or at own cabin).

Transportation (gasoline, oil, bus fare, air fare, etc.; excluding the cost of insurance, depreciation, and other items of a fixed nature).

Other Costs (ammunition, camera film, live bait, rental of equipment, license fees if only for this one trip, etc.; any items that could have been utilized on more than one trip were excluded).

Food expenditures presented a minor problem since they are legitimate on-site expenditures but also take place regardless of whether a recreation activity is undertaken or not. Consequently, expenditures for food and refreshments per trip consisted of those outlays that represented additional expenditures above the amount that the member(s) of a household who went on a trip would have spent at home on these items for the same time period. The amount that households would have spent at home was computed on a standardized cost per day per person basis according to family size and income. Computations were made in terms of 1972 dollars from data contained in a report by the U.S. Department of Agriculture, Agricultural Research Service (1968).

Transportation expenditures for passenger vehicles were computed on the basis of estimated average variable transportation costs per mile from the original to the recreation site and back as well as additional on-site travel. The variable transportation costs included the cost of gasoline, oil, repairs, tires, taxes, and fees. As per the U. S. Department of Commerce (1971), a weighted average of 5.2 cents per mile was calculated. For ease of computation, and since mileage could not be estimated to decimal points, an even five cents per mile was used in the computations. If transportation expenses were shared

with others in the recreating group, then only that percent paid by the respondent was included.

Methods for Estimating the Number of Households at a Site and the Response Rate

In order to determine the total number of days or trips per year taken by households to a particular site at alternative added costs, the sample household-trips or days must be expanded by the appropriate response rate. The response rate can only be computed if the total households that went to one of the selected sites during the study year are known. This section describes the alternative methods developed for estimating the total households that participated in recreation at the selected sites during the year 1972. First, household trips were estimated, then the trip estimates (where an individual household may have made a number of trips) were reduced to estimates of individual households.

Traffic Counters

One method used to determine the number of household-trips at a site during a year was to install traffic counters at the entrances to each of the sites. Most traffic counters record the number of axles that cross the entrance to a site. Thus, traffic counts must be divided by two to arrive at vehicle counts since most vehicles have two axles. Four of the five sites selected for this study had only one entrance, therefore, vehicles left the site over the same traffic counter as they entered the site. To arrive at the number of household-visits at the

site, the vehicle counts had to be divided by two. It was assumed that each vehicle that crossed the traffic counter was a household unit.

At the sites where the Forest Service had installed traffic counters, counts were recorded by the Forest Service on a daily basis during the recreation season. At one site where the researcher installed a traffic counter, counts were taken every two weeks throughout most of the year.

The traffic counts at several of the sites may have been biased upwards, since the same vehicles entered and left the site several times during their visit for the purpose of purchasing supplies or visiting a nearby site.

Visual Counts

A second method employed to estimate the number of household-trips at a site was to take a visual count of vehicles entering a site during a sample of several days of the recreation use season.

A researcher would station himself near the registration booth, but out of sight of visitors to a site, and record the number of vehicles that entered the site, their license plate numbers and whether or not they registered at the registration desk. Both a weekday and a weekend day were sampled in this manner. The total count of vehicles was then expanded by the number of weekend and weekdays that a specific site was open for recreation.

A record was also kept of the percent of vehicles that stopped at the registration desks to register. If the assumption is made that the rate of registration during the sample check remains the same

throughout the remainder of the season, estimates of household-trips can be made by dividing the number of registrants for the season by the percent of registrants of the visual check.

RIM Double Sample

Estimates were also made from the U.S. Forest Service RIM Center double sample. Forest Service personnel sample recreation sites for a minimum of twelve days. Half of the samples must be taken on weekend days and holidays, half on weekdays. Each of the sampling days consists of twelve hours, during which an observer gathers and records data at regular intervals. The figures are weighted and expanded for the entire recreation season by the Forest Service RIM Center to produce estimates of the number of visits (people) to a site per season.

Converting Visits to Households

In order to determine the appropriate response rate for each site, the estimated total visit data had to be converted to estimated number of individual households making the visits.

For the traffic counter method and the visual counts method, the resulting estimates of household-trips were divided by the average number of trips per sampled households to arrive at the total number of individual households visiting a site per season.

The RIM estimates were in terms of the number of people at a site per season. This estimate was divided by the average number of members in a household (computed from the sample data) to arrive at household-vists. These household-visits were then divided by the

average number of visits per sample households to arrive at the total number of households visiting a site per season.

Table 4 shows the resulting household estimates at the five representative study sites, using the alternative methods, and the average estimate of the four methods employed. An average of the four methods employed for estimating households was computed since no single estimate was considered "most reliable." At Horsethief Basin, traffic counts grossly overestimated households because vehicles entered and left the site several times during the day. At Knoll Lake traffic counts were also overestimated because many households drove their vehicles from the campground to the lake and back. At Horsethief Basin, Knoll Lake, and Luna Lake the RIM double sample was rated by the U.S. Forest Service as not very reliable. The visual counts cannot be considered extremely accurate since only two days out of the entire recreation season were sampled.

The response rates listed in Table 4 were computed as the number of usable returned questionnaires divided by the mean estimated number of households visiting the site. These rates are used to expand the sample trips and days made by households during a recreation season.

The Statistical and Mathematical Models

Demand estimates express the relationship between quantities demanded and various prices of goods. The individual demand functions for outdoor recreation involve similar relationships using the substitute variables described earlier. The resulting second-stage function expresses the willingness on the part of the recreationist to pay for

Table 4. Number of Households at Selected Recreation Sites During 1972 Using Different Estimating Techniques, and the Resulting Response Rate.

Recreation Sites	Household Estimates Using Different Techniques					Response Rates
	RIM Center Technique	Traffic Counts	Visual Count	Visual Count Percent Registered	Mean	
Brushy Basin	(a)	1,700	1,700	2,800	2,100	.3019
Horsethief Basin	3,800	(b)	1,900	1,800	2,500	.1172
Knoll Lake	3,900	4,700	4,200	4,000	4,200	.1576
Black Canyon Lake	4,000	3,600	3,900	4,000	3,900	.0923
Luna Lake	6,200	(c)	6,700	5,700	6,400	.0727

[a]U.S. Forest Service did not sample this site.

[b]Traffic counts were so inconsistent they could not be used.

[c]No traffic counters were installed at site.

the use of a recreation site. The following discussion describes the methodology used to arrive at demand estimates and ultimately resource values for specific outdoor recreation sites.

The generalized first-stage statistical demand function to be estimated is of the following form (Milstein, et al., 1966):

$$\sum_i D_{ir} = f\,(P_{ir}, P_{ia}, \ldots, P_{in}, Y_i : S_{ir}, S_{ia}, \ldots, S_{in},$$

$$E_{ir}, E_{ia}, \ldots, E_{in}, L_i : T_i)$$

where:

D_{ir} = the total demand by the population of invididuals i for recreation activity r

P_{ir} = the money price or cost to consumer i of participating in activity r (including the costs of travel to and from the site of r)

$P_{ia}, \ldots, P_{in}$ = the money prices of the n significantly competitive or complementary leisure or non-leisure activities obtainable by individual i (including respective travel costs)

Y_i = the relevant income (money budget) of i

S_{ir} = the time cost for i to participate at the consumption site in activity r (excluding travel time to and from the site)

$S_{ia}, \ldots, S_{in}$ = the inherent time required to make use of the significant alternative goods or services (excluding travel time)

E_{ir} = travel times for i enroute to and from the site of activity r

$E_{ia}, \ldots, E_{in}$ = travel times for i to the purchase sites of the significant alternatives

L_i = the leisure or discretionary time (budget) available to i for participation in outdoor recreation or significant alternative activities

T_i = The individual tastes or preferences of i; that is, the consumer's relative rankings of alternatives which may be purchased out of his time and money budgets

From this generalized statement, what usually remains for explicit treatment in an empirical model is, in addition to participation costs, the money income or budget of the decision making unit and those socio-economic variables that affect sonsumer preferences such as age, ethnic background, education, occupation, etc. It is recognized that a statistically derived demand relation will rarely include more than four or five statistically significant independent variables in its final form. Data were available to attempt to include six independent variables as defined below.

Multiple regression analysis was used to derive the statistical demand estimates. This technique fits a curve to data points minimizing the sum of errors squared where error is defined as the difference between the observed and predicted values of the dependent variable. The general form of the function used may be stated as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6)$$

where:

Y = estimated number of household-trips or days to a site by an individual household

X_1 = variable costs per visit or per day, depending on the definition of Y

X_2 = average roundtrip mileage from point of origin to site

X_3 = age of head of household

X_4 = education of head of household

X_5 = household income per year

X_6 = number of days of paid vacation of head of household

Several forms of equations were tested in order to achieve the best fit. These forms were as follows:

1. $Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6$

2. $Y = a + b_1X_1 + b_2X_1^2 + b_3X_2 + b_4X_2^2 + b_5X_3 + b_6X_3^2 + b_7X_4 + b_8X_4^2 + b_9X_5 + b_{10}X_5^2 + b_{11}X_6^2 + b_{12}X_6^2$

3. $Y = a + \frac{b_1}{X_1} + \frac{b_2}{X_2} + \frac{b_3}{X_3} + \frac{b_4}{X_4} + \frac{b_5}{X_5} + \frac{b_6}{X_6}$

where:

a = the regression constant

b = the regression coefficients

other variables are defined above

For each representative recreation site, stepwise regression analysis was applied to determine the stability and significance of the regression coefficients, and explanatory power of the hypothesized statistical demand determinants. Both trips taken to a site per year and days taken at a site per year were subgrouped when it was determined that those recreators that took many trips or days to a site reacted to the independent variables in a different fashion than those who took only a few. The specific subgroups and the reasons for their use at a particular site will be described in a later chapter.

The second part of the Clawson-Hotelling approach to recreation demand estimates the demand for the specific site or resource. This second demand curve is derived from the statistical demand curve which described the demand for the total recreation experience. In all cases the quadratic form of the equation (form number 2) gave the best fit and was used for evaluation purposes.

Mechanically, each recreation site was evaluated in a manner similar to the method employed by Martin, Gum, and Smith (1973).

1. An individual demand curve was estimated for each household using that household's observed number of trips or days as the maximum that this household would take at zero additional cost. The estimated trips or days are determined by subtracting the change in trips or days that would be taken as a result of increased costs from the actual trips or days taken to a site per year. The decrease in trips or days was estimated as costs increased, until the estimated trips or days either became zero or started increasing. (The estimate would begin increasing in certain cases where the statistical demand curve reached a minimum before touching the cost axis. Since an increase in activity in response to increased cost is not logical, estimated activity was set at zero if the minimum point was reached before estimated activity reached zero). In short,

   Estimated trips or days = Actual trips or days
   - change in trips or days

$$\text{Change in trips or days} = b_1 \text{ (added cost)} - 2b_2 \text{ (original cost x added cost)} - b_2^2 \text{ (added cost)}$$

Where:

b_1 is the cost coefficient

b_2 is the $(\text{cost})^2$ coefficient

added cost = \$1, 2, 3, . . ., 1,000

original cost = actual cost per trip or per day for each individual household

2. After new demand curves were estimated for each sampled household, the estimates were expanded by the relevant response rate and aggregated.
3. Via the computer program, the aggregate number of trips or days, the associated total revenue (trips or days times added cost), and the cumulative sum of estimated trips or days were estimated and printed out at each level of added cost.
4. From the print-out, the nondiscriminating monopolist value (the maximum total revenue and its corresponding added cost) was selected by inspection.
5. The consumer surplus value was the cumulative sum of estimated trips or days because the trips or days were estimated for every additional dollar of added cost until the total estimated trips or days reached zero.

For one of the recreation sites, Brushy Basin-Four Peaks, regression and correlation analysis revealed no statistically significant

relationship between household-trips or household-days per year and the surrogate price variable or the socioeconomic variables. These results would imply that participating households' tastes and preferences for this site were so strong that neither the variable cost of recreating, nor the distance to the site, nor the household income was a factor in determining how many trips or days households took at this site per year. With the major surrogate demand determinants being statistically insignificant, the resource could not be valued using the Clawson-Hotelling approach.

An alternative approach available for use in valuing the resource is referred to as the "direct" technique. This approach attempts to establish a statistical demand curve by asking households directly how much of an entry fee they would be willing to incur for the use of the recreation site rather than be excluded (Knetsch and Davis, 1966). Such questions were included in the questionnaires for every site, but were used only for the Brushy Basin-Four Peaks area. The responses of willingness to pay and the associated number of days and/or trips actually taken were arrayed and cumulated downward to express the total days or trips that would be taken at or below each given price. The sample data were expanded by the appropriate response rate and the result was a schedule of demand relating the number of trips and/or days households would take to this area, to their expressed willingness to pay an entry fee for the use of the facility. A statistical demand curve can be estimated from the above data by applying least squares regression analysis. The resulting equation directly estimates the demand for the resource.

The resource can then be valued using the nondiscriminating monopolist method and the consumer surplus method as described above.

CHAPTER IV

DESCRIPTION AND CHARACTERISTICS OF THE REPRESENTATIVE SITES AND THEIR VISITING HOUSEHOLDS

Luna Lake

Luna Lake is located in the Apache National Forest, a few miles east of Alpine in Apache County. The elevation in this area exceeds 8,000 feet and the vegetation consists mainly of spruce, pine, and aspen. The recreation use season is from April through October. The site consists of a 75-surface-acre lake, a campground with forty developed family units, a picnic area, a boat launch, a boat rental and a grocery concession. The major recreation activity at this site is fishing and camping.

The site has easy access from U.S. Highway 180 and since it is located very near the New Mexico border, many of its visitors reside in New Mexico. One-fourth of its visitors reside in the Phoenix area and about one-third reside outside the state of Arizona. The majority of visitors travel over 200 miles one-way to reach this site. Most households do not make one-day outings to Luna Lake. According to the sample taken, households spend an average of four days per trip at this site. The majority of households visiting Luna Lake take one trip per year to this site.

Table 5 describes the socioeconomic characteristics of households that visited Luna Lake in 1972. Approximately 50 percent of the heads

Table 5. Socioeconomic Characteristics of Households Visiting Luna Lake, 1972[a].

Age Distribution of Heads of Households		Education of Heads of Households		Household Size	
Age	Percent of Heads of Households	Education in Years	Percent of Heads of Households	Number in Household	Percent of Household
17-25	5.5	Elementary (6 or less)	1.3	1	5.1
26-35	21.5			2	35.4
36-45	24.4	Junior High (7 - 9)	10.4	3	17.1
46-55	25.3	High School (10 - 12)	40.4	4	21.5
56-64	14.0			5	11.3
65 and Over	9.3	College (13 - 16)	33.5	6-8	2.9
TOTAL	100.0	Graduate and Post Graduate (17 or more)	14.4	9 or more	.7
		TOTAL	100.0	TOTAL	100.0

Table 5. Continued

Household Income		Ethnic Backgrounds of Households	
Income Bracket in Dollars	Percent of Households	Ethnic Background	Percent of Households
0-2,999	1.6	White except Spanish-American	90.7
3,000-5,999	7.1	Black - Negro	0
6,000-8,999	14.9	Spanish-American	8.9
9,000-11,999	27.3	Oriental	.2
12,000-14,999	18.6	American Indian	.2
15,000-17,999	10.2	Other	0
18,000-20,999	7.5	TOTAL	100.0
21,000-23,999	4.7		
24,000-26,999	3.3		
27,000-29,999	1.3		
30,000 or more	3.5		
TOTAL	100.0		

[a]Based on a sample of households registering at the site during the 1972 outdoor recreation season.

of households that participated in outdoor recreation at Luna Lake were in the 36-55 year age group with about 25 percent above and below the 36-55 year age group. About 88 percent of the heads of households had at least a high school education and almost 48 percent had some college education.

The greatest single class of visitors were couples without children. Almost 46 percent of the households had incomes of between $9,000 and $15,000, while 9 percent had less than $6,000 and 13 percent had incomes greater than $21,000. Nine percent of the heads of households were of Spanish-American ethnic background and almost 91 percent were of white ethnic background.

Black Canyon Lake

This site is part of the Sitgreaves National Forest and is situated about 20 miles southwest of Heber in Coconino County atop the Mogollon Rim. The elevation at the lake is about 7,000 feet and the vegetation consists mainly of ponderosa pine.

The recreation season at Black Canyon Lake normally ranges from April through October, depending upon weather conditions. Access is by way of a seven mile stretch of unpaved road from State Highway 160. After lengthy winters and/or heavy rains, access to the site is severely limited.

The site consists of a 78-surface-acre lake with a boat launch, paved parking areas and picnic facilities. Overnight camping is not allowed at the site itself, but several miles from the site there are areas where camping is allowed. Many of the households that visit Black

Canyon Lake do so as a day excursion trip from some other lake, campsite, or town less than 75 miles distant. The major activity at this site is cold water fishing.

Three-fourths of the households that recreate at Black Canyon Lake take no more than two trips per year. The average length of stay per trip for a household is one day. The site is close enough to the Phoenix metropolitan area that weekend trips can be undertaken, though heaviest use is during the summer when the majority of households take their vacations. Over 80 percent of its visitors reside in the Phoenix metropolitan area.

Table 6 describes the socioeconomic characteristics of the households that visited Black Canyon Lake during the 1972 outdoor recreation season. Approximately 45 percent of the heads of households that visited Black Canyon Lake in 1972 were between the ages of 36 and 55, 5 percent fewer than those visiting Luna Lake. Most of this difference is made up in the 17 to 25 year age group which has 5 percent more than the same age group for Luna Lake. The education levels of the heads of households that visited this site were almost the same as those that visited Luna Lake; about 90 percent attained at least a high school education and 48 percent had some college education.

In contrast to Luna Lake, there was a greater tendency for the households visiting Black Canyon Lake to consist of three or more members. The household incomes of visitors to this site are very slightly higher than incomes of those recreating at Luna Lake. Almost 35 percent had incomes over $15,000 whereas 30 percent of the recreators at Luna Lake

Table 6. Socioeconomic Characteristics of Households Visiting Black Canyon Lake, 1972.[a]

Age Distribution of Heads of Households		Education of Heads of Households		Household Size	
Age	Percent of Heads of Households	Education in Years	Percent of Heads of Households	Number in Household	Percent of Household
17-25	10.3	Elementary (6 or less)	0	1	8.3
26-35	23.3			2	28.1
36-45	24.4	Junior High (7 - 9)	10.5	3	15.0
46-55	21.4	High School (10 - 12)	42.5	4	22.5
56-64	14.4			5	14.2
65 and Over	6.1	College (13 - 16)	37.7	6-8	11.1
TOTAL	100.0	Graduate and Post Graduate (17 or more)	10.3	9 or more	.8
		TOTAL	100.0	TOTAL	100.0

Table 6. Continued

Household Income		Ethnic Backgrounds of Households	
Income Bracket in Dollars	Percent of Households	Ethnic Background	Percent of Households
0-2,999	1.1	White except Spanish-Americans	97.8
3,000-5,999	9.2	Black - Negro	.3
6,000-8,999	12.8	Spanish-American	.8
9,000-11,999	23.1	Oriental	0
12,000-14,999	19.4	American Indian	1.1
15,000-17,999	14.2	Other	0
18,000-20,999	10.0	TOTAL	100.0
21,000-23,999	3.1		
24,000-26,999	1.9		
27,000-29,999	1.1		
30,000 or more	4.2		
TOTAL	100.0		

[a]Based on a sample of households registering at the site during the 1972 outdoor recreation season.

had incomes greater than $15,000. Almost 98 percent of the heads of households visiting Black Canyon Lake were of white ethnic background.

Knoll Lake

Knoll Lake is also located on the Mogollon Rim. The lake is in the Coconino National Forest about fifty miles north of Payson and 25 miles south of the Blue Ridge Ranger Station. The elevation is approximately 7,500 feet and the vegetation consists mainly of ponderosa pine.

The recreation use season under normal conditions is from May through September. The season is often shortened due to late winters or heavy rains which make the 30 miles of unpaved Old Rim Road, the only access to this site, virtually impassable with any type of vehicle. Access to the Old Rim Road can be gained from either State Highway 87 west of the site or State Highway 260 east of the site. The distance from either points of access to the site is approximately the same.

Knoll Lake is a 77-surface-acre lake with a boat launch. It is one of numerous lakes established by the Arizona Game and Fish Department on the Mogollon Rim. Camping facilities for about 40 families are a few hundred yards away from the lake. The major activities at this site are camping and cold water fishing.

The site is about 150 miles from the Phoenix metropolitan area where approximately 80 percent of its visitors reside. Some of the households that visit this site do so only on a day-use basis. However, since there are many lakes within close proximity of each other on the Mogollon Rim, many of its users establish a home camp and then during their stay in the area travel to several sites. Over 80 percent of the

visiting households took no more than two trips per year to this site and during their visit the average length of stay was two days.

Table 7 lists the socioeconomic characteristics of households that visited Knoll Lake during the 1972 outdoor recreation season. About 45 percent of the heads of households visiting Knoll Lake were between the ages of 36 and 55; 5 percent fewer than those that visited Luna Lake and about the same as at Black Canyon Lake. Slightly more than 44 percent of the visitors were in the 17 to 35 year age bracket; heads of households visiting Knoll Lake are typically younger than those that visited either Luna Lake or Black Canyon Lake. Approximately 92 percent of the heads of households attained at least a high school education, 4 percent more than those that visited Luna Lake. About 52 percent had some college education; this is also 4 percent more than those heads of households that visited either Luna Lake or Black Canyon Lake.

The size of the households visiting Knoll Lake was very similar to the households that visited Black Canyon Lake. About 65 percent of the households consisted of three or more members. About 42 percent of the households had incomes that ranged between $9,000 and $15,000, very much like the other two sites discussed. Only 7 percent had incomes below $6,000 as compared to 9 percent for Luna Lake and 10 percent for Black Canyon Lake. Almost 98 percent of the heads of households visiting Knoll Lake were of white ethnic background, the same percent as for Black Canyon Lake.

Table 7. Socioeconomic Characteristics of Households Visiting Knoll Lake, 1972[a].

Age Distribution of Heads of Households		Education of Heads of Households		Household Size	
Age	Percent of Heads of Households	Education in Years	Percent of Heads of Households	Number in Household	Percent of Household
17-25	13.8	Elementary (6 or less)	.6	1	8.3
26-35	30.6			2	26.7
36-45	24.6	Junior High (7 - 9)	7.0	3	18.7
46-55	21.0	High School (10 - 12)	40.2	4	20.7
56-64	8.9			5	14.4
65 and Over	2.8	College (13 - 16)	37.8	6-8	10.1
		Graduate and Post Graduate (17 or more)	14.5	9 or more	1.1
TOTAL	100.0			TOTAL	100.0
		TOTAL	100.0		

Table 7. Continued

Household Income		Ethnic Backgrounds of Households	
Income Bracket in Dollars	Percent of Households	Ethnic Background	Percent of Households
0-2,999	1.4	White except Spanish-Americans	97.7
3,000-5,999	6.0	Black - Negro	0
6,000-8,999	14.5	Spanish-American	1.5
9,000-11,999	21.6	Oriental	.2
12,000-14,999	20.8	American Indian	.6
15,000-17,999	15.9	Other	0
18,000-20,999	8.5	TOTAL	100.0
21,000-23,999	4.8		
24,000-26,999	2.5		
27,000-29,999	.8		
30,000 or more	3.3		
TOTAL	100.0		

[a]Based on a sample of households registering at the site during the 1972 outdoor recreation season.

Horsethief Basin

Horsethief Basin is situated in the Bradshaw mountains about 80 miles north of the Phoenix metropolitan area in the Prescott National Forest. The elevation at the site is about 6,000 feet and the vegetation is primarily ponderosa pine.

The recreation use season normally ranges from May through November. Access is from Interstate 17, about 40 miles north of Phoenix. From that point the next 30 miles of road are extremely rough, winding, and narrow. The elevation increases from 1,500 feet at the points of access to over 6,000 feet at the site. Almost 90 percent of the site's users reside in the Phoenix metropolitan area.

The Basin has several distinct picnic areas and campsites that permit overnight camping. A very small reservoir, whose main purpose is to provide water for Crown King and the Basin, allows a limited amount of fishing. Both in nearby Crown King and the Basin, grocery concessions are available. During the peak summer season, cabins are available for rent. In addition, there are also about forty summer homes in the area. The site is most heavily used on the weekends and holidays.

Over 80 percent of the visiting households take one or two trips per year and the average length of stay per trip is two days.

Table 8 describes some of the socioeconomic characteristics of the households that registered at Horsethief Basin. Almost 46 percent of the heads of households visiting Horsethief Basin were between the ages of 36 and 55; this is slightly less than Luna Lake, but about the same as Black Canyon Lake and Knoll Lake. Only 9 percent of the visitors exceeded age 55 as compared to 11 percent for Knoll Lake, 20 percent for

Table 8. Socioeconomic Characteristics of Households Visting Horsethief Basin, 1972[a].

Age Distribution of Heads of Households		Education of Heads of Households		Household Size	
Age	Percent of Heads of Households	Education in Years	Percent of Heads of Households	Number in Household	Percent of Households
17-25	13.3	Elementary (6 or less)	0	1	9.9
26-35	31.7			2	23.9
36-45	27.0	Junior High (7 - 9)	2.4	3	16.7
46-55	18.8	High School (10 - 12)	34.5	4	23.3
56-64	6.8			5	12.6
65 and Over	2.4	College (13 - 16)	44.7	6-8	11.9
TOTAL	100.0	Graduate and Post Graduate (17 or more)	18.4	9 or more	1.7
				TOTAL	100.0
		TOTAL	100.0		

Table 8. Continued

Household Income		Ethnic Backgrounds of Households	
Income Bracket in Dollars	Percent of Households	Ethnic Background	Percent of Households
0-2,999	2.1	White except Spanish-American	98.3
3,000-5,999	4.8	Black - Negro	0
6,000-8,999	12.6	Spanish-American	1.4
9,000-11,999	22.2	American Indian	0
12,000-14,999	21.2	Oriental	.3
15,000-17,999	14.3	Other	0
18,000-20,999	6.8	TOTAL	100.0
21,000-23,999	6.1		
24,000-26,999	1.7		
27,000-29,999	3.1		
30,000 or more	5.1		
TOTAL	100.0		

[a]Based on a sample of households registering at the site during the 1972 outdoor recreation season.

Black Canyon Lake and 23 percent for Luna Lake. A much larger percent of the heads of households visiting Horsethief Basin (63 percent) had at least some college education as compared to 48 percent for Luna Lake and 52 percent for Knoll Lake.

The size of the households visiting this site are similar to the households that visited both Black Canyon Lake and Knoll Lake. Approximately 66 percent of the households consisted of three or more members. Slightly more than 43 percent of the households had incomes that ranged between $9,000 and $15,000, very similar to other sites. Sixteen percent, though, had incomes of $21,000 or more per year as opposed to only 10 percent for Black Canyon Lake and 13 percent for Luna Lake. Over 98 percent of the heads of households were of white ethnic background, a similar fact observed for both Black Canyon Lake and Knoll Lake.

Brushy Basin-Four Peaks

Rather than being a specific site, Brushy Basin-Four Peaks is an area that covers over 3,000 acres of land with a vegetation that ranges from the lower elevation desert shrubs to the higher elevation ponderosa pine. The area is located in the Tonto National Forest about 60 miles northeast of the Phoenix metropolitan area.

The type of recreation carried on at this site is referred to by the U.S. Forest Service as dispersed recreation. There are no developed campsites or facilities in the entire area. Recreational activities include hiking, camping, rock hounding, sightseeing, hunting, and cross-country cycling.

A large portion of this area is covered by a mixed shrub type known as chaparral. Much of this vegetation is so dense and overgrown that access by game, man, and livestock is extremely difficult. This brush-covered land is of little value. It affords poor grazing and is not much better as a wildlife habitat. It is felt by the U.S. Forest Service that in addition to the above drawbacks, the dense vegetation constitutes a serious fire hazard and has a very low water yield.

This chaparral area was chosen by the U.S. Forest Service to experiment with economical methods of converting the dense stands of chaparral into patchwork patterns of open grassland with scattered clumps of desirable shrubs and some dense patches of chaparral. This patchwork pattern is designed to improve wildlife, grazing and water yield values, while protecting or enhancing the recreational values and reducing the fire hazard. The U.S. Forest Service is concerned with the effect that the chaparral treatment had upon the people who used this area for recreational purposes.

The outdoor recreation activities listed above are carried on in this area on a year-round basis. Peak season for the area is in the spring and late fall. Most of the use occurs during the weekends and holidays. Access to the area is either from State Highway 87 west of the site or from State Highway 188 east of the site. Approximately 20 to 30 miles of extremely narrow, steep, and treacherous dirt road must be traversed after leaving the state highways. The use of conventional automobiles to reach the area is discouraged by road signs leading to the area.

Over 98 percent of the visiting households reside in the Phoenix metropolitan area. Of these, 45 percent live in Scottsdale and Mesa. The majority of the trips taken to Brushy Basin average one day in duration. Over 40 percent of the households took 2 to 5 trips per year to this area.

Table 9 describes the socioeconomic characteristics of households sampled at Brushy Basin-Four Peaks in 1972. The sample indicates that the heads of households at this site are younger than at any other of the sampled sites. Over 55 percent are in the 17-35 year age bracket. Almost 63 percent of the heads of households had some college education. This characteristic resembles households that visited Horsethief Basin, but is higher than the other selected sites.

Over 40 percent of the households consisted of 1 to 2 family members, a figure that is similar to households that visited Luna Lake. The difference becomes evident when comparing the ages of the households visiting the two sites. Households visiting Brushy Basin are relatively young and have not established a family, whereas households visiting Luna Lake are in the age brackets where the children no longer reside with their parents.

Although a smaller percent (37 percent) of the households visiting Brushy Basin had incomes between $9,000 and $15,000 compared to the other sites, almost 42 percent had incomes in excess of $15,000. Almost all the heads of households that visited Brushy Basin-Four Peaks were of white ethnic background.

Table 9. Socioeconomic Characteristics of Households Visiting Brushy Basin-Four Peaks, 1972.[a]

Age Distribution of Heads of Households		Education of Heads of Households		Household Size	
Age	Percent of Heads of Households	Education in Years	Percent of Heads of Households	Number in Household	Percent of Households
17-25	25.9	Elementary (6 or less)	.8	1	15.9
26-35	30.7			2	25.6
36-45	20.7	Junior High (7 - 9)	4.1	3	14.1
46-55	12.4	High School (10 - 12)	31.6	4	21.7
56-64	5.4			5	11.1
65 and Over	4.9	College (13 - 16)	44.6	6-8	10.5
TOTAL	100.0	Graduate and Post Graduate (17 or more)	17.9	9 or more	1.1
				TOTAL	100.0
		TOTAL	100.0		

Table 9. Continued

Household Income		Ethnic Backgrounds of Households	
Income Bracket in Dollars	Percent of Households	Ethnic Background	Percent of Households
0-2,999	3.8	White except Spanish-American	99.0
3,000-5,999	5.9	Black - Negro	0
6,000-8,999	11.6	Spanish-American	.7
9,000-11,999	19.1	American Indian	0
12,000-14,999	18.1	Oriental	.3
15,000-17,999	15.6	Other	0
18,000-20,999	10.7	TOTAL	100.0
21,000-23,999	5.2		
24,000-26,999	4.1		
27,000-29,999	1.4		
30,000 or more	4.5		
TOTAL	100.0		

[a]Based on a sample of households registering at the site during the 1972 outdoor recreation season.

Summary

As can be seen from Table 10, the selected representative sites are quite diverse in terms of elevation, vegetation, access, development, nearness to a large population center, and types of activities engaged in by recreators.

The elevation ranges from a low of 2,000 feet in parts of Brushy Basin, whose vegetation is primarily desert shrub, to a high of over 8,000 feet at Luna Lake where the vegetation consists mainly of spruce and pine.

Access to the sites ranges from extremely easy at Luna Lake, to a seven mile dirt road at Black Canyon Lake, to 30 miles of unpaved road at Knoll Lake, to 20 miles of extremely dangerous and winding road at Brushy Basin. The sites range in distance from the Phoenix metropolitan area from 60 miles for Brushy Basin to 250 miles for Luna Lake.

Development at the selected representative sites ranges from no development at Brushy Basin to a highly developed site such as Luna Lake or Horsethief Basin where grocery concessions are available as well as campsites with shelters, boat rentals, water, toilets, and rental cabins.

All of the sites except Brushy Basin have water-based recreation available. Table 10 points out that a wide range of outdoor recreation activities may be undertaken.

Table 11 is a summary of the socioeconomic characteristics of households that visited the selected representative sites in 1972. The representative age of heads of households visiting Brushy Basin is 28, the youngest for all the sites sampled, as compared to the oldest representative age of 47 for Luna Lake.

Table 10. Summary of Characteristics of the Selected Representative Sites.

Recreation Site	Elevation	Vegetation	Access from Major Highways	One way distance from Phoenix Metropolitan Area
Luna Lake	8,000 ft.	Spruce, pine, aspen	Easy	250 miles
Black Canyon Lake	7,000 ft.	Ponderosa pine	7 miles dirt road	140 miles
Knoll Lake	7,500 ft.	Ponderosa pine	30 miles unpaved road	150 miles
Horsethief Basin	6,000 ft.	Ponderosa pine	30 miles winding, unpaved road	80 miles
Brushy Basin-Four Peaks	2,000 to 7,000 ft.	Desert shrub and Ponderosa pine	20 miles winding, treacherous unpaved road	60 miles

Recreation Site	Development	Main Activities	Recreation Season
Luna Lake	Grocery Concession, camp sites, picnic areas, shelters, cabin rentals, water, toilets	Camping, picnicking	May - November
Black Canyon Lake	Boat ramp, picnic area, paved parking, toilets	Cold water fishing	April - October
Knoll Lake	Family campsite, toilets	Cold water fishing, camping	May - September
Horsethief Basin	Grocery concession, camp sites, picnic areas, shelters, cabin rentals, water, toilets	Camping, picnicking	May - November
Brushy Basin-Four Peaks	No Development	Camping, hiking, rockhounding, cycling	All year

Table 11. Summary of Socioeconomic Characteristics of Households Visiting the Selected Representative Sites, 1972.

Recreation Site	Representative Age of Heads of Households[a]	Representative Education of Heads of Households[a]	Representative Household Size[b]	Representative Household Income[a]	Representative Ethnic Background
Luna Lake	47	12	3.3	$10,800	White except Spanish-American
Black Canyon Lake	39	12	3.5	$11,200	White except Spanish-American
Knoll Lake	33	12	3.5	$11,700	White except Spanish-American
Horsethief Basin	33	14	3.6	$11,700	White except Spanish-American
Brushy Basin-Four Peaks	28	14	3.3	$11,300	White except Spanish-American

[a]Model Value

[b]Mean Value

The representative level of education attained by heads of households visiting Luna Lake, Knoll Lake, and Black Canyon Lake is 12 years, while those visiting Horsethief Basin and Brushy Basin is 14 years.

The size of the households ranged from a low of 3.3 members for Brushy Basin and Luna Lake to 3.6 members for Horsethief Basin.

The highest representative family income level was recorded by households visiting Knoll Lake and Horsethief Basin at $11,700 per year. The lowest representative income level was recorded for households visiting Luna Lake at $10,800 per year.

The representative ethnic background for all sites was predominantly white. Very few households from ethnic minority groups participated in outdoor recreation at the selected representative sites.

CHAPTER V

GROSS HOUSEHOLD EXPENDITURES

This chapter presents estimates of the expenditures that were incurred by households who participated in outdoor recreation at the selected representative sites in the Salt-Verde Basin during the 1972 recreation season. Expenditures are classified by type of expenditure, by income, by place of residence, by number of trips taken per year, and by number of days of recreation taken at a site per year. Estimated total variable expenditures provide some indication of the economic activity that is generated by the recreation resource. This expenditure is not the total economic value of the resource. It does not reflect the expenditure that households participating in outdoor recreation would have been willing to incur rather than to forego that recreation experience. It is likely that some recreators would be willing to make larger expenditures of some or all types than they are currently making. The real economic value of experiencing the recreational activity is often greater than the amount of expenditure actually made (Brown, Singh, and Castle, 1964). Economic values are detailed in Chapter VI.

Only variable expenditures were included in determining how much households spent on outdoor recreation, since these are the costs that are considered by households when planning a trip and are incurred only if a trip is undertaken. The expenditure estimates detailed in this chapter serve as data for all value estimates made in Chapter VI.

Each sampled household was asked to record the number of trips made to a site per year as well as the variable costs incurred during the sampled trip. Each individual household's costs by category were multiplied by the number of trips taken to that site during 1972. Each household's costs were expanded by the relevant response rate for that site and aggregated to arrive at estimated total expenditures by categories. This process was repeated for each of the representative study sites.

Luna Lake

Total variable expenditures by categories for Luna Lake are summarized in Table 12. Transportation costs accounted for about 37 percent of total expenditures, while food and refreshments were another 20 percent. Lodging costs at this site were higher than at any of the other four sites because the average distance traveled by households was greater and the average stay per trip was much longer than at any of the other study sites. Total expenditures incurred by recreationists who visited Luna Lake in 1972 were $520,710, the largest amount for any of the study sites.

Total variable expenditures for households were also tabulated by income groups (Table 13). Most groups with yearly incomes below $21,000 spent less proportionately than their weight in the sample. Households with yearly incomes above $21,000 had greater expenditures than their proportion in the sample. The highest income groups, $18,000 and over, accounted for only about 25 percent of the total expenditures and as shown in Table 14, they made fewer trips to the site than any of

Table 12. Total Variable Expenditures by Type of Expenditure - Luna Lake, 1972.

Type of Expenditure	Cost in Dollars	Percent
Additional food, refreshments, and liquor	104,786.80	20.1
Lodging (motels, hotels, trailer courts, camp fees)	83,768.91	16.1
Transportation (gas, oil, bus fare, air fare)	194,809.66	37.4
Other (ammunition, camera film, live bait, equipment rental)	137,345.25	26.4
TOTAL	520,710.63	100.0

Table 13. Household Variable Expenditures by Income Groups - Luna Lake, 1972.

Yearly Income Level ($)	Percent of Households	Expenditures Per Household Per Year ($)	Total Expenditures by Income Group ($)	Percent of Total Expenditures
Under 3,000	1.6	71.02	6,838.38	1.3
3,000- 5,999	7.1	69.87	30,752.41	5.9
6,000- 8,999	15.0	77.51	71,428.40	13.7
9,000-11,999	27.0	84.35	140,393.77	27.0
12,000-14,999	18.8	64.38	74,383.77	14.3
15,000-17,999	10.0	99.50	61,588.03	11.8
18,000-20,999	7.6	60.91	28,486.80	5.5
21,000-23,999	4.7	127.85	36,931.91	7.1
24,000-26,999	3.3	113.81	23,481.43	4.4
27,000-29,999	1.3	240.68	19,863.82	3.8
Over 29,999	3.6	120.69	26,561.90	5.1
TOTAL	100.0		520,710.63	100.0

Table 14. Trips and Days of Recreation Taken by Households in Relation to Household Income Level - Luna Lake, 1972.

Yearly Income Level ($)	Percent of Households	Total Trips Taken	Average Trips Taken Per Household	Total Days at Site	Average Days at Site Per Household
Under 3,000	1.6	12	1.7	78	11.1
3,000- 5,999	7.1	67	2.1	308	9.6
6,000- 8,999	15.0	118	1.8	438	6.5
9,000-11,999	27.0	223	1.8	860	7.1
12,000-14,999	18.8	119	1.4	431	5.1
15,000-17,999	10.0	78	1.7	344	7.6
18,000-20,999	7.6	58	1.7	206	6.1
21,000-23,999	4.7	41	2.0	162	7.7
24,000-26,999	3.3	28	1.9	133	8.9
27,000-29,999	1.3	10	1.7	54	9.0
Over 29,999	3.6	19	1.2	88	5.5
TOTAL	100.0	773		3,102	

the other income groups. The $9,000 to $11,999 income group took the most trips per year to the site and stayed at the site the most number of days.

Recreation trip expenses, by place of residence, are summarized in Table 15. Since Luna Lake is close to the New Mexico border, many of its visitors reside in that state. The sample indicates that 33 percent of the households came from New Mexico and the southwest Texas area. They accounted for 37 percent of all the variable trip expenditures incurred by households visiting this site. The Phoenix metropolitan area, which included about 25 percent of all the households, were responsible for 23 percent of the expenditures incurred by recreationists at this site. The next largest group was Pima County residents which accounted for 18 percent of the households and who spent over $90,000 visiting Luna Lake in 1972.

Table 16 indicates that almost 68 percent of all the sampled households that visited Luna Lake during the 1972 recreation season took only one trip and they spent less (42 percent) proportionately than their weight in the sample. Those households that took more than one trip to the site per year had greater expenditures than their proportion in the sample. Only 3 percent of the recreators took more than 5 trips per year and they accounted for 7 percent of expenditures.

Table 17 classifies household expenditures by number of days spent at a site per year. Per household expenditures rise rapidly as the number of days spent at the site per year increases. The per household expenditures ranged from a low of $14 for a one day trip to a high of $232 for a 25 day and over trip which averaged to about $9 per day.

Table 15. Household Variable Expenditures by Place of Residence - Luna Lake, 1972.

Origin[a] No.	Place	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
	Phoenix Metropolitan Area	25.1	82.43	119,044.38	22.9
	Phoenix City	13.6	80.44	74,152.35	14.3
15	Phoenix	1.1	68.56	4,715.27	.9
16	Phoenix	3.8	115.86	27,091.75	5.2
17	Phoenix	3.1	88.24	16,991.75	3.3
18	Phoenix	2.5	113.31	17,144.09	3.3
19	Phoenix	2.2	35.03	4,819.12	.9
20	Phoenix	.9	61.62	3,390.65	.7
21	Scottsdale	4.2	59.76	15,616.92	3.0
22	Mesa	3.3	60.16	12,411.97	2.4
23	Tempe	2.0	54.08	6,694.64	1.3
27	Chandler	.9	64.36	3,541.27	.7
29	Gila Bend	.2	205.80	2,830.81	.5
31	Glendale	.7	65.57	2,705.64	.5
35	Sun City	.2	79.30	1,090.78	.2
1	Mohave County	.7	98.63	4,070.15	.8
2	Yuma County	2.0	107.07	13,254.47	2.6
3	Coconino County	.4	97.50	2,682.26	.5

Table 15. Continued

Origin[a] No.	Place	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
4	Yavapai County	.9	82.66	4,548.14	.9
5	Gila County	.9	51.84	2,852.13	.6
6	Pinal County	1.8	72.62	7,991.75	1.5
7	Pima County	17.9	82.14	90,384.11	17.4
9	Cochise County	4.9	60.29	18.244.15	3.5
10	Graham County	2.0	79.67	9,862.45	1.9
11	Greenlee County	8.5	86.78	45,360.01	8.7
12	Navajo County	.7	32.02	1,321.18	.3
13	Apache County	.7	116.10	4,790.92	.9
14	Maricopa County (excluding Phoenix Metropolitan Area)	.4	115.80	3,185.69	.6
	Out of State	33.1	86.44	193,118.85	37.1
	TOTAL	100.0		520,710.63	100.0

[a]Map and key to divisions and places of origin are located in Appendix B.

Table 16. Household Variable Expenditures by Number of Trips Taken to Site Per Year - Luna Lake, 1972.

Number of Trips to Site Per Year	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
1	67.5	52.00	216,029.06	41.5
2	17.4	135.05	144,893.40	27.8
3	7.4	130.20	59,809.35	11.4
4	2.2	236.66	32,552.96	6.3
5	2.9	164.81	29,470.43	5.7
6	.4	182.40	5,017.88	1.0
7	1.1	366.03	25,174.00	4.4
8	.2	0	0	0
9	0	0	0	0
10	.2	168.00	2,310.87	.5
Over 10	.7	172.97	7,137.55	1.4
TOTAL	100.0		520,710.63	100.0

Table 17. Household Variable Expenditures by Number of Days Taken at Site Per Year - Luna Lake, 1972.

Number of Days at Site Per Year	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
1	6.9	14.32	6,107.29	1.2
2	12.9	24.90	19,867.98	3.8
3	14.0	43.41	37,616.23	7.2
4	17.4	59.33	63,652.89	12.2
5	8.7	74.24	39,825.31	7.7
6	6.9	105.81	45,116.92	8.7
7	2.9	105.64	18,889.96	3.6
8	4.7	130.47	37,686.38	7.2
9-12	11.6	124.04	88,722.08	17.0
13-18	7.4	171.10	77,667.81	14.9
19-25	5.1	209.92	66,412.65	12.8
Over 25	1.3	231.97	19,145.12	3.7
TOTAL	100.0		520,710.63	100.0

Households that took 6 or less days at the site per year spent less proportionately than their weight in the sample. Households that took more than 6 days per year had greater expenditures than their proportion in the sample. Approximately 25 percent of the households took 9 or more days per year and accounted for almost half of the expenditures.

Black Canyon Lake

Total variable expenditures for Black Canyon Lake was $191,870.68. Table 18 summarized variable expenditures by category. The largest category was transportation, totalling $93,876.68 and accounting for 49 percent of all expenditures. Only 6 percent of all expenditures were for lodging. There are minimal accommodations available in this area and most visits are rarely longer in duration than one day. Additional food and refreshment expenditures were almost 20 percent of the total expenditures.

Expenditures incurred by recreationists according to their income classifications are summarized in Table 19. Households in the $9,000 to $14,999 income group comprise almost 43 percent of the sample and account for 44 percent of all expenditures made at this site. The highest per household expenditures incurred by any income group was recorded by the $12,000 to $14,999 income group with $68.16 per household. Households with incomes of $21,000 or more had smaller expenditures than their proportion in the sample with only 8 percent of total expenditures. Most trips taken to the site and highest average trips taken was recorded for the $12,000 to $14,999 income group as shown in Table 20. This same

Table 18. Total Variable Expenditures by Type of Expenditure - Black Canyon Lake, 1972.

Type of Expenditure	Cost in Dollars	Percent
Additional food, refreshments, and liquor	36,208.02	18.9
Lodging (motels, hotels, trailer courts, camp fees)	11,083.42	5.8
Transportation (gas, oil, bus fare, air fare)	93,896.68	48.9
Other (ammunition, camera film, live bait, equipment rental)	50,682.56	26.4
TOTAL	191,870.68	100.0

Table 19. Household Variable Expenditures by Income Groups - Black Canyon Lake, 1972.

Yearly Income Level ($)	Percent of Households	Expenditures Per Household Per Year ($)	Total Expenditures by Income Group ($)	Percent of Total Expenditures
Under 3,000	1.1	12.62	547.13	.3
3,000- 5,999	9.2	33.94	12,135.43	6.3
6,000- 8,999	12.8	62.48	31,136.83	16.2
9,000-11,999	23.1	36.31	32,651.35	17.0
12,000-14,999	19.4	68.16	51,693.39	26.9
15,000-17,999	14.2	55.64	30,745.94	16.0
18,000-20,999	10.0	45.12	17,597.29	9.2
21,000-23,999	3.1	47.73	5,688.52	3.0
24,000-26,999	1.9	49.78	3,775.46	2.0
27,000-29,999	1.1	28.87	1,251.35	.7
Over 29,999	4.2	28.60	4,648.00	2.4
TOTAL	100.0		191,870.68	100.0

Table 20. Trips and Days of Recreation Taken by Households in Relation to Household Income Level - Black Canyon Lake, 1972.

Yearly Income Level ($)	Percent of Households	Total Trips Taken	Average Trips Taken Per Household	Total Days at Site	Average Days at Site Per Household
Under 3,000	1.1	4	1.0	4	1.0
3,000- 5,999	9.2	86	2.6	138	4.2
6,000- 8,999	12.8	122	2.7	244	5.3
9,000-11,999	23.1	178	2.1	289	3.5
12,000-14,999	19.4	252	3.6	468	6.7
15,000-17,999	14.2	148	2.9	235	4.6
18,000-20,999	10.0	102	2.8	222	6.2
21,000-23,999	3.1	16	1.5	22	2.0
24,000-26,999	1.9	17	2.4	20	2.9
27,000-29,999	1.1	8	2.0	8	2.0
Over 29,999	4.2	26	1.7	36	2.4
TOTAL	100.0	959		1,686	

income group also took the most days per year at the site but comprised only 19 percent of the sample households.

Trip expenditures, by place of residence, are summarized in Table 21. The majority of the households (84 percent) visiting Black Canyon Lake reside in the Phoenix metropolitan area and 53 percent reside within the Phoenix city limits. Although a very small portion of the households (3.6 percent) visiting Black Canyon Lake reside in Navajo County, they accounted for about 14 percent of total expenditures incurred at this site. This same group of households was also responsible for recording the highest per household expenditures of $194.47. Out of state households accounted for only .3 percent of the sample and incurred only .1 percent of total expenditures.

Table 22 reveals that almost 60 percent of the sampled households that visited Black Canyon Lake during the 1972 recreation season took only one trip and spent less proportionately (19 percent) than their weight in the sample. All households taking more than one trip to the site had greater expenditures than their proportion in the sample. Slightly more than 4 percent of the sample households took more than 10 trips and accounted for almost 29 percent of total expenditures.

Table 23 indicates that Black Canyon Lake is mainly used by recreationists on a day-use-basis. Almost 43 percent of the sample households took only one day per year at this site and spent $11.52 per household, 10 percent of total expenditures. Only about 15 percent of the households took more than 8 days per year, but they accounted for almost 55 percent of total expenditures.

Table 21. Household Variable Expenditures by Place of Residence - Black Canyon Lake, 1972.

Origin[a] No.	Place	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
	Phoenix Metropolitan Area	84.1	40.34	147,436.66	77.3
	Phoenix City	52.9	46.10	98,651.61	51.8
15	Phoenix	6.7	36.31	9,441.50	4.9
16	Phoenix	10.6	65.63	27,017.93	14.1
17	Phoenix	11.7	55.07	25,059.86	13.1
18	Phoenix	11.1	43.73	18,951.48	9.9
19	Phoenix	6.4	52.56	13,096.40	6.8
20	Phoenix	6.4	23.29	5,804.44	3.0
21	Scottsdale	8.3	29.74	9,666.41	5.0
22	Mesa	10.0	40.12	15,647.89	8.2
23	Tempe	5.6	41.60	9,015.17	4.7
24	Avondale	.3	12.00	130.01	.1
25	Buckeye	.6	17.77	385.16	.2
26	Cashion	.8	10.53	342.36	.2
27	Chandler	1.7	29.77	1,934.99	1.0
31	Glendale	3.6	77.46	10,910.08	5.7
35	Sun City	.3	69.50	752.98	.4
1	Mohave County	.3	128.25	1,389.49	.7

Table 21. Continued

Origin[a] No.	Place	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
2	Yuma County	1.4	1.56	84.51	.1
3	Coconino County	.3	16.20	175.51	.1
4	Yavapai County	.6	13.50	292.52	.2
5	Gila County	2.8	24.84	2,690.73	1.4
6	Pinal County	2.5	24.44	2,383.53	1.2
7	Pima County	3.6	20.94	2,949.08	1.5
12	Navajo County	3.6	194.47	27,390.57	14.3
14	Maricopa County (excluding Phoenix Metropolitan Area)	.8	193.45	6,287.65	3.3
	Out of State	.3	6.50	70.42	.1
	TOTAL	100.0		191,870.68	100.0

[a]Map and key to divisions and places of origin are located in Appendix B.

Table 22. Household Variable Expenditures by Number of Trips Taken to Site Per Year - Black Canyon Lake, 1972.

Number of Trips to Site Per Year	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
1	59.4	15.65	36,289.71	18.9
2	15.3	50.75	30,239.41	15.8
3	7.2	50.39	14,195.33	7.4
4	2.5	71.07	6,930.36	3.6
5	5.3	82.89	17,062.57	8.9
6	3.6	128.19	18,055.25	9.4
7	.6	154.52	3,348.32	1.8
8	.6	107.20	2,322.86	1.2
9	.8	250.05	8,127.30	4.2
10	.3	15.00	162.51	.1
Over 10	4.4	318.07	55,137.05	28.7
TOTAL	100.0		191,870.68	100.0

Table 23. Household Variable Expenditures by Number of Days at Site Per Year - Black Canyon Lake, 1972.

Number of Days at Site Per Year	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
1	42.8	11.52	19,228.76	10.0
2	13.9	18.26	9,892.74	5.2
3	8.6	43.65	14,659.31	7.6
4	7.8	44.83	13,600.76	7.1
5	3.6	38.01	5,353.74	2.8
6	5.3	52.18	10,741.06	5.6
7	1.1	117.36	5,086.13	2.7
8	2.5	91.76	8,947.13	4.7
9-12	8.1	102.45	32,188.24	16.8
13-18	3.6	172.46	24,290.36	12.7
19-25	1.1	136.77	5,927.41	3.1
Over 25	1.7	645.41	41,955.04	21.9
TOTAL	100.0		191,870.68	100.0

Knoll Lake

For Knoll Lake total variable expenditures in 1972 were estimated to be $231,907.56. Table 24 summarizes expenditure estimates. Almost 44 percent of all expenditures were for transportation. Since this site is extremely isolated and the majority of the visitors are campers, lodging costs were not expected to be large; in fact, they amounted to only 2 percent of all expenditures. Food expenditures amounted to about 33 percent of the total expenses incurred by recreationists visiting Knoll Lake.

Table 25 tabulates expenditures by income groups. The $12,000 to $14,999 income group, which included about 21 percent of the sample households, had greater expenditures (31.9 percent) than their proportion in the sample while most other groups spent less proportionately than their weight in the sample. The two income groups $9,000 to $11,999 and $12,000 to $14,999 accounted for about 52 percent of all expenditures. Table 26 indicates that on the average the $21,000 to $23,999 income group took 2.5 trips per year to this site, the highest of all the income groups. The $15,000 to $17,999 income group, comprising almost 16 percent of the sample population, took on the average the highest number of days per year (5.0 days) at this site.

Recreation trip expenditures, by place of residence, are shown in Table 27. Most of the households (85 percent) visiting Knoll Lake reside in the Phoenix metropolitan area and of those, 48 percent reside within the Phoenix city limits. Households from the Phoenix metropolitan area accounted for 74 percent of all expenditures, but this amount was proportionately less than the Phoenix visitors' weight in the sample.

Table 24. Total Variable Expenditures by Type of Expenditure - Knoll Lake, 1972.

Type of Expenditure	Cost in Dollars	Percent
Additional food, refreshments, and liquor	75,304.57	32.5
Lodging (motels, hotels, trailer courts, camp fees)	4,314.72	1.9
Transportation (gas, oil, bus fare, air fare)	101,469.74	43.8
Other (ammunition, camera film, live bait, equipment rental)	50,818.53	21.9
TOTAL	231,907.56	100.0

Table 25. Household Variable Expenditures by Income Groups - Knoll Lake, 1972.

Yearly Income Level ($)	Percent of Households	Expenditures Per Household Per Year ($)	Total Expenditures by Income Group ($)	Percent of Total Expenditures
Under 3,000	1.4	19.94	1,136.90	.5
3,000- 5,999	6.0	59.83	15,185.10	6.6
6,000- 8,999	14.5	50.77	30,927.24	13.3
9,000-11,999	21.6	51.68	46,891.03	20.2
12,000-14,999	20.8	84.52	74,009.36	31.9
15,000-17,999	15.9	45.23	30,135.91	13.0
18,000-20,999	8.5	39.40	13,999.56	6.0
21,000-23,999	4.8	50.03	10,157.84	4.4
24,000-26,999	2.4	31.42	3,190.04	1.4
27,000-29,999	.8	19.31	612.79	.3
Over 29,999	3.3	40.56	5,661.80	2.4
TOTAL	100.0		231,907.56	100.0

Table 26. Trips and Days of Recreation Taken by Households in Relation to Household Income Level - Knoll Lake, 1972.

Yearly Income Level ($)	Percent of Households	Total Trips Taken	Average Trips Taken Per Household	Total Days at Site	Average Days at Site Per Household
Under 3,000	1.4	14	1.6	26	2.9
3,000- 5,999	6.0	84	2.1	164	4.1
6,000- 8,999	14.5	180	1.9	367	3.8
9,000-11,999	21.6	284	2.0	700	4.9
12,000-14,999	20.8	262	1.9	608	4.4
15,000-17,999	15.9	213	2.0	522	5.0
18,000-20,999	8.5	94	1.7	220	3.9
21,000-23,999	4.8	81	2.5	146	4.6
24,000-26,999	2.4	21	1.3	55	2.6
27,000-29,999	.8	6	1.2	10	2.0
Over 29,999	3.3	34	1.6	76	3.5
TOTAL	100.0	1,273		2,894	

Table 27. Household Variable Expenditures by Place of Residence - Knoll Lake, 1972.

Origin[a] No.	Place	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
	Phoenix Metropolitan Area	84.5	51.92	172,728.36	73.92
	Phoenix City	48.0	59.77	109,875.61	47.13
15	Phoenix	5.4	41.60	9,503.55	4.10
16	Phoenix	12.1	46.54	23,624.68	10.19
17	Phoenix	12.5	49.06	26,130.27	11.27
18	Phoenix	8.0	48.04	16,155.46	6.97
19	Phoenix	5.9	64.84	16,046.14	6.92
20	Phoenix	4.1	107.99	17,815.51	7.68
21	Scottsdale	11.6	41.10	20.080.65	8.66
22	Mesa	9.7	39.79	16,158.57	6.97
23	Tempe	7.4	36.04	11,205.90	4.83
24	Avondale	.6	56.05	1,422.59	.61
25	Buckeye	.5	41.60	791.88	.34
27	Chandler	1.5	48.28	3,063.69	1.32
28	El Mirage	.3	110.25	1,399.11	.60
30	Gilbert	.3	25.00	317.26	.14
31	Glendale	3.5	39.55	5,771.80	2.49
32	Goodyear	.5	46.33	881.96	.38
34	Peoria	.3	31.30	397.21	.17

Table 27. Continued

Origin[a] No.	Place	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
35	Tolleson	.3	50.60	642.13	.28
1	Mohave County	.2	16.00	101.52	.04
2	Yuma County	.3	2.02	25.70	.01
3	Coconino County	1.7	20.15	1,406.09	.61
4	Yavapai County	1.8	28.11	2,140.23	.92
5	Gila County	2.4	18.66	1,894.19	.82
6	Pinal County	1.7	58.61	4,091.05	1.76
7	Pima County	3.3	285.21	39,813.13	17.17
12	Navajo County	3.2	73.59	9,805.20	4.23
13	Apache County	.2	13.20	83.76	.04
14	Maricopa County (excluding Phoenix Metropolitan Area)	.9	24.28	224.49	.40
	Out of State	.2	33.70	213.83	.09
	TOTAL	100.0		231,907.56	100.0

[a]Map and key to divisions and places of origin are located in Appendix B.

Although only about 3 percent of the households visiting Knoll Lake resided in Pima County, they were responsible for 17 percent of the expenditures incurred by households participating in recreation at this site. Only .2 percent of the sample households resided out-of-state and they accounted for only .1 percent of expenditures.

Table 28 categorizes expenditures incurred by recreationists according to the number of trips they took to a site per year. The data reveal that 65 percent of the sampled households took only one trip per year to Knoll Lake and spent less proportionately (41 percent) than their weight in the sample. Only slightly more than 1 percent of the households took more than 10 trips, but they accounted for almost 12 percent of the expenditures.

According to figures from Table 29, about 20 percent of the sample households took only one day per year at this site and incurred 6 percent of the total expenditures. Almost 57 percent of the visitors stayed two to four days per year, yet they spent less proportionately (44 percent) than their weight in the sample. Only 12 percent took more than 9 days per year at Knoll Lake, yet they incurred 35 percent of total expenditures.

Horsethief Basin

Total variable expenditures for Horsethief Basin in 1972 were $112,992.68. Table 30 categorizes total variable expenditures by type of expenditure. The largest portion, almost 44 percent, was incurred by recreationists for transportation. The smallest portion of the total expenditure, 6.9 percent, was for lodging. The percent for lodging at

Table 28. Household Variable Expenditures by Number of Trips Taken to Site Per Year - Knoll Lake, 1972.

Number of Trips to Site Per Year	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
1	65.3	34.67	95,044.83	41.0
2	16.6	47.23	32,963.97	14.2
3	8.2	57.55	19,719.35	8.5
4	3.5	116.49	17,000.95	7.3
5	1.7	165.99	11,585.50	5.0
6	1.1	175.11	7,777.92	3.4
7	.9	114.68	4,366.12	1.9
8	.9	263.40	10,027.92	4.3
9	.2	94.50	599.62	.3
10	.5	273.50	5,206.22	2.2
Over 10	1.4	483.57	27,615.16	11.9
TOTAL	100.0		231,907.56	100.0

Table 29. Household Variable Expenditures by Number of Days Taken at Site Per Year - Knoll Lake, 1972.

Number of Days at Site Per Year	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
1	19.5	17.25	14,118.18	6.1
2	22.8	55.89	53,553.35	23.1
3	19.5	27.88	22,817.08	9.8
4	14.4	41.41	24,962.45	10.8
5	2.6	62.27	6,717.01	2.9
6	5.4	53.09	12,126.27	5.2
7	.5	95.55	1,818.85	.8
8	3.8	93.54	14,838.20	6.4
9-12	6.0	88.08	22,355.33	9.6
13-18	3.6	168.64	25,681.28	11.1
19-25	1.2	366.52	18,604.85	8.0
Over 25	.8	451.20	14,314.72	6.2
TOTAL	100.0		231,907.56	100.0

Table 30. Total Variable Expenditures by Type of Expenditure - Horsethief Basin, 1972.

Type of Expenditure	Cost in Dollars	Percent
Additional food, refreshments, and liquor	33,361.77	29.5
Lodging (motels, hotels, trailer courts, camp fees)	7,807.17	6.9
Transportation (gas, oil, bus fare, air fare)	49,170.15	43.5
Other (ammunition, camera film, live bait, equipment rental)	22,653.58	20.1
TOTAL	112,992.68	100.0

this site is higher than at some of the other sites because during the peak season rental cabins are available for the recreationists. The percent of expenditures attributed to food and refreshments is similar to the other sites, about 30 percent.

Expenditures that households incurred at Horsethief Basin are classified by income groups in Table 31. The largest percent of sample households (22 percent) fell into the $9,000 to $11,999 income group who accounted for 41 percent of the total expenditures. Groups with yearly incomes above $18,000 had expenditures that were less than their proportion in the sample. Table 32 points out that the $3,000 to $5,999 income group took the highest average trips (5.3) and days (7.9) to the site per year.

Household trip expenditures by place of residence are summarized in Table 33. Almost 90 percent of the households visiting Horsethief Basin reside in the Phoenix metropolitan area and 66 percent of those reside within the Phoenix city limits. Those households residing in the Phoenix metropolitan area accounted for 96.1 percent of all expenditures incurred at this site. Only .3 percent of the sample households came from out of state and they were responsible for .2 percent of all expenditures.

Due to the close proximity of Horsethief Basin to the Phoenix metropolitan area, where most of its visitors reside, the majority of the visits are taken on weekends. Table 34 indicates that 72 percent of the sample households take only one trip to this site per year and are responsible for a much smaller proportion of expenditures (23 percent) than their weight in the sample. Most households taking more than two

Table 31. Household Variable Expenditures by Income Groups - Horsethief Basin, 1972.

Yearly Income Level ($)	Percent of Households	Expenditures Per Household Per Year ($)	Total Expenditures by Income Group ($)	Percent of Total Expenditures
Under 3,000	2.0	17.54	897.72	.1
3,000- 5,999	4.8	65.30	7,800.61	6.9
6,000- 8,999	12.6	26.49	8,364.27	7.4
9,000-11,999	22.2	84.23	46,712.67	41.3
12,000-14,999	21.1	30.64	16,208.83	14.4
15,000-17,999	14.3	56.53	20,256.61	17.9
18,000-20,999	6.8	27.04	4,614.59	4.1
21,000-23,999	6.1	20.18	3,099.40	2.7
24,000-26,999	1.7	11.70	505.12	.4
27,000-29,999	3.1	18.10	1,389.93	1.2
Over 29,999	5.1	24.56	3,142.92	2.8
TOTAL	100.0		112,992.68	100.0

Table 32. Trips and Days of Recreation Taken by Households in Relation to Household Income Level - Horsethief Basin, 1972.

Yearly Income Level ($)	Percent of Households	Total Trips Taken	Average Trips Taken Per Household	Total Days at Site	Average Days at Site Per Household
Under 3,000	2.0	10	1.7	19	3.2
3,000- 5,999	4.8	74	5.3	110	7.9
6,000- 8,999	12.6	55	1.5	126	3.4
9,000-11,999	22.2	219	3.4	478	7.4
12,000-14,999	21.1	131	2.1	286	4.6
15,000-17,999	14.3	95	2.3	246	5.9
18,000-20,999	6.8	25	1.3	62	3.1
21,000-23,999	6.1	31	1.7	71	3.9
24,000-26,999	1.7	5	1.0	5	1.0
27,000-29,999	3.1	21	2.3	42	4.7
Over 29,999	5.1	22	1.5	44	2.9
TOTAL	100.0	688		1,489	

Table 33. Household Variable Expenditures by Place of Residence - Horsethief Basin, 1972.

Origin[a] No.	Place	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
	Phoenix Metropolitan Area	89.4	48.72	108,377.60	96.1
	Phoenix City	65.8	47.68	76,718.43	68.0
15	Phoenix	7.2	15.13	2,710.58	2.4
16	Phoenix	17.7	49.62	22,013.71	19.5
17	Phoenix	18.4	54.37	25,051.41	22.2
18	Phoenix	10.9	21.32	5,820.61	5.2
19	Phoenix	5.8	121.46	17,617.43	15.6
20	Phoenix	5.8	24.16	3,504.69	3.1
21	Scottsdale	5.8	92.61	13,432.59	11.9
22	Mesa	2.0	16.31	834.90	.7
23	Tempe	4.4	55.24	6,127.56	5.4
24	Avondale	.3	12.40	105.80	.1
27	Chandler	.7	13.70	233.79	.2
29	Gila Bend	.3	33.20	283.28	.2
31	Glendale	7.8	33.87	6,647.01	5.9
34	Peoria	.7	197.40	3,368.60	3.0
35	Sun City	1.4	11.55	394.20	.4
37	Tolleson	.3	27.12	231.44	.2

Table 33. Continued

Origin[a] No.	Place	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
2	Yuma County	.3	26.50	226.11	.2
3	Coconino County	.3	12.40	105.80	.1
4	Yavapai County	4.1	16.17	1,655.93	1.5
5	Gila County	.3	9.25	78.92	.1
6	Pinal County	.3	35.70	304.61	.3
7	Pima County	.3	22.90	195.39	.2
12	Navajo County	.3	0	0	0
14	Maricopa County (excluding Phoenix Metropolitan Area)	3.8	19.58	1,837.99	1.6
	Out of State	.3	30.35	258.96	.2
	TOTAL	100.0		112,992.68	100.0

[a]Map and key to divisions and places of origin are located in Appendix B.

Table 34. Household Variable Expenditures by Number of Trips Taken to Site Per Year - Horsethief Basin, 1972.

Number of Trips to Site Per Year	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
1	72.4	14.56	26,335.37	23.3
2	11.3	30.97	8,719.33	7.7
3	4.4	111.49	12,366.68	10.9
4	4.1	83.37	8,536.54	7.6
5	1.0	38.37	982.30	.9
6	.7	114.15	1,947.95	1.7
7	.3	58.10	495.73	.4
8	1.0	137.07	3,508.53	3.1
9	1.4	199.80	6,819.11	6.0
10	.3	143.00	1,220.14	1.1
Over 10	3.1	547.73	42,061.01	37.2
TOTAL	100.0		112,992.68	100.0

trips per year to Horsethief Basin had greater expenditures than their proportion in the sample.

According to Table 35, 58 percent of the sample households participated in recreation at this site one to two days per year and accounted for only 15 percent of total expenditures incurred by recreationists. Per household expenditures rose rapidly as the number of days per year increased. They ranged from a low of $10.91 for those who took only one day per year to over $20 per day for those who took more than 25 days per year.

Brushy Basin-Four Peaks

Total variable expenditures incurred by households at Brushy Basin-Four Peaks are the lowest of any of the other sites at $60,108.42. Table 36 summarizes total variable expenditures by type of expenditure. The largest portion, 53 percent, was for transportation. Lodging expenditures were only .4 percent due to the close proximity of the site to the Phoenix metropolitan area where most of its visitors reside. Food and refreshment expenditures accounted for 28 percent of the expenditures incurred by households visiting this area.

Expenditures incurred by households visiting Brushy Basin are also categorized by income groups in Table 37. Households included in the $6,000 to $17,999 income groups comprised almost 65 percent of the sample households and they accounted for almost 72 percent of total expenditures. Households in the higher income groups, $18,000 and over, which included about 26 percent of the sample households, spent less proportionately (16 percent) than their weight in the sample. Table 38

Table 35. Household Variable Expenditures by Number of Days at Site Per Year - Horsethief Basin, 1972.

Number of Days at Site Per Year	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
1	31.7	10.91	8,655.76	7.7
2	26.3	12.32	8,091.45	7.2
3	12.3	16.02	4,922.14	4.4
4	8.5	28.72	6,126.17	5.4
5	.3	16.00	136.52	.1
6	5.1	37.22	4,763.23	4.2
7	.7	95.82	1,635.24	1.5
8	3.1	75.12	5,768.77	5.1
9-12	3.8	95.53	8,965.87	7.9
13-18	5.1	172.19	22,037.76	19.5
19-25	.7	145.34	2,480.22	2.2
Over 25	2.4	659.83	39,409.56	34.9
TOTAL	100.0		112,992.68	100.0

Table 36. Total Variable Expenditures by Type of Expenditure - Brushy Basin-Four Peaks, 1972.

Type of Expenditure	Cost in Dollars	Percent
Additional food, refreshments, and liquor	16,886.52	28.1
Lodging (motels, hotels, trailer courts, camp fees)	245.72	.4
Transportation (gas, oil, bus fare, air fare)	31,980.38	53.2
Other (ammunition, camera film, live bait, equipment rental)	10,995.80	18.3
TOTAL	60,108.42	100.0

Table 37. Household Variable Expenditures by Income Groups - Brushy Basin-Four Peaks, 1972.

Yearly Income Level ($)	Percent of Households	Expenditures Per Household Per Year ($)	Total Expenditures by Income Group ($)	Percent of Total Expenditures
Under 3,000	3.8	30.98	2,404.14	4.0
3,000- 5,999	5.8	39.37	4,709.50	7.8
6,000- 8,999	11.8	46.28	11,222.72	18.7
9,000-11,999	19.1	27.57	10,785.61	18.0
12,000-14,999	18.1	27.85	10,354.36	17.2
15,000-17,999	15.6	33.70	10,785.93	17.9
18,000-20,999	10.6	13.98	3,028.27	5.0
21,000-23,999	5.2	25.87	2,760.18	4.6
24,000-26,999	4.1	14.44	1,213.98	2.0
27,000-29,999	1.4	73.52	2,139.18	3.6
Over 29,999	4.4	7.78	704.56	1.2
TOTAL	100.0		60,108.42	100.0

Table 38. Trips and Days of Recreation Taken by Households in Relation to Household Income Level - Brushy Basin-Four Peaks, 1972.

Yearly Income Level ($)	Percent of Households	Total Trips Taken	Average Trips Taken Per Household	Total Days at Site	Average Days at Site Per Household
Under 3,000	3.8	72	3.0	114	4.8
3,000- 5,999	5.8	127	3.4	186	5.0
6,000- 8,999	11.8	282	3.8	346	4.6
9,000-11,999	19.1	357	3.0	438	3.6
12,000-14,999	18.1	354	3.1	491	4.3
15,000-17,999	15.6	293	3.0	424	4.3
18,000-20,999	10.6	123	1.8	156	2.3
21,000-23,999	5.2	108	3.3	191	5.8
24,000-26,999	4.1	59	2.3	93	3.6
27,000-29,999	1.4	30	3.3	48	5.3
Over 29,999	4.4	42	1.5	66	2.4
TOTAL	100.0	1,847		2,553	

indicates that the average number of trips taken to this area per year is higher than all the other sites. Most income groups took on the average of 3 trips per year to this recreation area.

Recreation trip expenses, by place of residence are summarized in Table 39. Since Brushy Basin-Four Peaks is located only a short distance from the Phoenix metropolitan area, it is not surprising to find that 95 percent of the households visiting this area reside in the Phoenix metropolitan area. These households incurred 96 percent of all expenditures. Scottsdale and Mesa combined comprise the largest percent of households (45 percent) that visit Brushy Basin and they account for 41 percent of all expenditures. Out of state visitors comprise only .2 percent and incur only .1 percent of total expenditures.

Tables 40 and 41 categorize household expenditures according to the number of trips households took to the area per year and the number of days they stayed at the area per year. Almost 48 percent of the sample households took only one trip to Brushy Basin and accounted for only 12 percent of total expenditures. Only 4 percent of the households took more than ten trips to this area in 1972 yet they incurred 29 percent of the total expenditures.

The majority of the visits to this area are one day outings since it can be reached in less than two hours by most of its visitors. Table 41 indicates that about 70 percent of the sample households took 1 to 3 days per year at this recreation area, but incurred only 28 percent of total expenditures. Households that took more than 8 days comprised only 11 percent but accounted for 50 percent of total expenses.

Table 39. Household Variable Expenditures by Place of Residence - Brushy Basin-Four Peaks, 1972.

Origin[a] No.	Place	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
	Phoenix Metropolitan Area	95.3	26.32	57,672.56	96.0
	Phoenix City	32.1	38.66	25,345.44	42.2
15	Phoenix	6.9	24.13	3,433.24	5.7
16	Phoenix	2.8	33.45	1,946.72	3.2
17	Phoenix	5.8	34.11	4,080.89	6.8
18	Phoenix	6.0	49.67	6,102.85	10.2
19	Phoenix	8.2	45.05	7,573.49	12.6
20	Phoenix	2.4	45.53	2,208.25	3.7
21	Scottsdale	20.2	26.65	11,028.83	18.4
22	Mesa	24.9	26.27	13,418.09	22.3
23	Tempe	12.9	21.73	5,761.09	9.6
25	Buckeye	.3	12.72	82.28	.1
27	Chandler	1.6	17.05	551.41	.9
30	Gilbert	.9	13.90	269.56	.5
31	Glendale	1.7	29.29	1,041.67	1.7
35	Sun City	.2	15.65	50.60	.1
36	Surprise	.2	13.90	44.94	.1
37	Tolleson	.3	12.04	77.84	.1

Table 39. Continued

Origin[a] No.	Place	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
3	Coconino County	.2	11.02	35.64	.1
4	Yavapai County	.3	10.38	67.12	.1
5	Gila County	.5	0	0	0
6	Pinal County	2.1	39.23	1,648.66	2.7
7	Pima County	.9	34.09	661.33	1.1
14	Maricopa County (excluding Phoenix Metropolitan Area)	.5	5.48	53.18	.1
	Out of State	.2	16.40	53.02	.1
	TOTAL	100.0		60,108.42	100.0

[a]Map and key to divisions and places of origin are located in Appendix B.

Table 40. Household Variable Expenditures by Number of Trips Taken to Site Per Year - Brushy Basin-Four Peaks, 1972.

Number of Trips to Site Per Year	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
1	47.6	7.35	7,177.44	11.9
2	19.1	16.34	6,394.04	10.6
3	13.1	25.83	6,931.91	11.5
4	5.5	44.17	4,998.07	8.3
5	4.1	59.91	5,036.15	8.4
6	3.0	63.85	3,922.41	6.5
7	1.4	87.69	2,551.73	4.3
8	.8	59.72	965.41	1.6
9	.8	70.20	1,134.82	1.9
10	.6	296.50	3,834.46	6.4
Over 10	3.9	212.33	17,161.98	28.6
TOTAL	100.0		60,108.42	100.0

Table 41. Household Variable Expenditures by Number of Days Taken at Site Per Year - Brushy Basin-Four Peaks, 1972.

Number of Days at Site Per Year	Percent of Households	Expenditures Per Household Per Year ($)	Estimated Total Expenditures ($)	Percent of Total Expenditures
1	39.0	7.31	5,837.76	9.7
2	20.3	12.59	5,249.85	8.7
3	11.2	23.77	5,455.42	9.1
4	7.4	27.54	4,185.35	7.0
5	2.4	44.29	2,148.00	3.6
6	5.4	32.35	3,556.18	5.9
7	.6	63.17	817.01	1.4
8	2.8	47.29	2,752.27	4.6
9-12	5.4	75.73	8,324.66	13.9
13-18	3.2	109.69	7,092.79	11.8
19-25	.9	125.37	2,431.94	4.1
Over 25	1.4	421.24	12,257.19	20.4
TOTAL	100.0		60,108.42	100.0

Summary of Variable Expenditures

Total household expenditures at the representative sites ranged from a low of $60,108 at Brushy Basin-Four Peaks to a high of $520,711 at Luna Lake. Luna Lake, the site that is most distant from a major population center, is the most developed of all the sites and has the easiest access, had the highest total household expenditures. Brushy Basin-Four Peaks, which is completely undeveloped, extremely close to the Phoenix metropolitan area and has difficult access, had the lowest expenditures. For all of the sites transportation costs were the largest proportion of total costs ranging from 37 percent at Luna Lake to 53 percent at Brushy Basin-Four Peaks.

Lodging costs were lowest in proportion to total household expenditures. The highest proportion (16 percent) was recorded for Luna Lake where accomodations are available near the site and where most visitors travel long distances. The lowest proportion (.4 percent) was recorded for Brushy Basin-Four Peaks which is less than two hours drive from Phoenix and where most trips are one day outings.

Additional food and refreshment costs ranged from 19 percent at Black Canyon Lake where the majority of the visitors remain for less than one day, to 33 percent at Knoll Lake where many of the visitors are campers and remain at the site for several days.

The "other" category of expenditures ranged from 18 percent at Brushy Basin-Four Peaks to 26 percent at Luna Lake.

It must be recognized that although total variable expenditures provide some insight into the economic activity generated by a recreation resource, it does not reflect the value of the recreation resource.

Estimates of the economic value of the resource are given in the following chapter.

CHAPTER VI

ESTIMATION OF NET ECONOMIC VALUE FOR OUTDOOR RECREATION OF THE SELECTED SITES

In the preceding chapter estimates for total variable expenditures incurred by households visiting the selected recreation sites were made. These estimates provide some indication of the activity associated with the recreation resource. However, since they merely measure how much is spent per year by recreators at and traveling to and from a particular recreation site, they are not truly indicative of the value of the resource for the recreation opportunity produced. To determine the net value of the recreational resource, it is essential to obtain estimates of the underlying demand relationships for the recreational experience as a whole. Once demand for the total experience has been derived, net values of the resource itself can be estimated. The specific statistical and mathematical procedures involved in estimating the demand relationships and the net values were discussed in Chapter III.

The purpose of this chapter is to analyze and discuss the underlying empirical demand relationships and the net values derived for each selected representative recreation site. Each site receives separate treatment since each is unique and presented different estimation problems. Luna Lake serves as an example site in the preliminary discussion of the variables used and the selection of equation forms used.

Several algebraic forms were hypothesized for the demand relationships. Each function was tested for each site using multiple

stepwise regression analysis to determine the stability, significance, and explanatory power of the relevant demand variables. The simple linear demand function was found to be totally unacceptable since it was unable to successfully estimate demand equations for the recreation experience with any of the site data. In addition, the inverse form of the function ($Y = a + \frac{b_1}{X_1} + \frac{b_2}{X_2} + \ldots \frac{b_n}{X_n}$) was tested without significant improvement. Best overall results were achieved with a quadratic function of the following general form:

$$Y = a + b_1X_1 + b_2X_1^2 + b_3X_2 + b_4X_2^2 + \ldots b_{m-1}X_n + b_mX_n^2$$

Estimates for all sites except one were based on this algebraic form of the demand equation.

Factors hypothesized to be of importance in determining the number of trips or days taken to a site during the year are listed in Table 42. The most important independent variable from the viewpoint of using the two-stage Clawson-Hotelling estimating procedure is the average cost per trip (X_{1_t}) or per day (X_{1_d}) for a household to a particular site. The cost variable is crucial to the second stage of the analysis when net economic values for the resource are estimated. Added costs beyond the variable trip expenses are interpreted as substitutes for an entry fee per vehicle into a site for the expressed purpose of carrying on a particular recreation activity.

The nonmonetary costs of distance traveled (travel time expressed as the average roundtrip mileage from point of origin to site) are also hypothesized to be important demand shifters. Exclusion of these distance costs might result in an underestimate of value for a particular

Table 42. Variables Included in the Demand Equations.

Variables[a]	
Dependent Variable	Independent Variable
1. Y_t = Number of trips to site in 1972	1. X_{1_t} = Average variable cost per trip to site
or	or
2. Y_d = Number of days at site and in transit in 1972	X_{1_d} = Average variable cost per day at site and in transit
	2. $(X_{1_t})^2$
	or
	$(X_{1_d})^2$
	3. X_2 = Average roundtrip mileage from point of residence to site
	4. $(X_2)^2$
	5. X_3 = Age
	6. $(X_3)^2$
	7. X_4 = Years of Education
	8. $(X_4)^2$
	9. X_5 = Yearly Household Income
	10. $(X_5)^2$
	11. X_6 = Days of Paid Vacation
	12. $(X_6)^2$

[a]Data either relate to the household unit (e.g., income) or to head of household (e.g., education).

recreation site as pointed out by Knetsch (1963) and reiterated by Cesario and Knetsch (1970, p. 702):

> Perhaps the most serious difficulty of the travel cost method, as it has been applied in the past, is a consistent bias in the derived demand curve. This difficulty results from the basic assumption that the disutility of overcoming distance is a function only of money cost. This assumption is not correct. The effect of distance is likely to be a function of the time involved in making the trip, as well as the monetary cost . . .

Empirical results documenting the hypothesis of Cesario and Knetsch were recorded by Brown and Nawas (1971) and by Martin, Gum, and Smith (1973). Inclusion of these distance costs resulted in better specification of the model with increased explanation of the variance and had the effect of decreasing the cost coefficient and increasing the value of the resource. Therefore, visitor rates should be expressed not only as a function of money cost, but also as a function of time. Since time is a difficult variable to quantify, distance serves as a surrogate. The problem of multicollinearity normally present when including the two variables, distance and variable cost in the same equation under the standard Clawson-Hotelling model, is significantly reduced by using unaggregated data and employing the individual observation method as described by Brown and Nawas (1971).

In this study the same results were not achieved. Due to the close proximity of the majority of the sites to major population centers, distance costs were not always significant. For one site, Luna Lake, where distance was a significant variable, the inclusion of distance actually increased the cost coefficient and thus decreased the value of the resource. These results are discussed later.

In addition to the independent variables cost and distance, the following socioeconomic variables were tested for significance: age of head of household, years of education of head of household, yearly household income, and days of paid vacation per year of head of household.

Trips per year as the dependent variable was first tested with the quadratic demand equation for all sites. Results indicated that with this formulation significant and stable cost coefficients were not possible at any of the sites except Luna Lake where the R^2 value was extremely low (.05).

Days per year was then tested as the dependent variable and although the results for all sites were an improvement over using trips per year, for some sites the cost variable was still unstable and insignificant.

Further examination of the data revealed that for certain sites households taking 6 or more trips to a site per year apparently responded to different stimuli and had different associated variable costs from those households that took fewer than six trips per year to a site. For other sites, households taking more than 8 days at a site per year seemed to respond differently to the independent variables than those households that took 8 or fewer days per year at a site. These stratified samples were then tested using multiple regression analysis and for some sites improvements in the stability and significance of the cost coefficients occurred in addition to higher R^2 values.

At Black Canyon Lake, two distinct groups of households emerged. Households that traveled less than 75 miles to this site were those who took day excursion trips and differed in response from those households

whose primary objective was visiting Black Canyon Lake. When these households with low travel distances were omitted from the sample, improvements in the regression analysis occurred.

Households who were visiting a site for the first time, were also found to respond to different stimuli and had different associated costs than those households that had been to the site before. Households returning to a site must have received utility at least equal to the cost incurred by taking the trip, otherwise the return trip to the site would not have been taken. Households who had no prior knowledge and experience at a recreation site may not receive utility equal to the cost of the trip and thus never return to the site. When these first-trip households were omitted from the rest of the sample, improvements in the stability and significance of the cost coefficients were noted in addition to higher R^2 values.

In those cases where households making only a first trip to a site were deleted from the sample when estimating the statistical demand curve, site values were estimated under two assumptions. First, a low value was estimated, deleting the first trips entirely and assuming no utility was generated. Second, the quantity of first trips was added to the low estimate, assuming the value of these trips to be equal to the average values generated by those households taking more than one trip. This assumption would generate the highest possible value. The low and high estimates may be assumed to bracket the true value.

In those other cases where a portion of the sample was deleted for some other reason than being first trips, the quantity of trips or days was also added back in at the average values. In such cases where

many trips or days were taken, apparently in total disregard to cost, one must assume that valuing those trips or days at the average value would tend to underestimate total value.

The exact procedures for estimating the extra values on the excluded portion of the partitioned sample were as follows. Nondiscriminating monopolist values were generated by subtracting the estimated trips or days of the stratified data from the estimated trips or days of the total sample. The resulting omitted data are multiplied by the percent of days or trips estimated for that year at the nondiscriminating monopolist price. This figure is then multiplied by the nondiscriminating monopolist price of the stratified data and added to the nondiscriminating monopolist value of the stratified data to arrive at the total estimate of the nondiscriminating monopolist value.

To determine the consumer surplus value it was assumed that those households not included in the statistical demand formulation received at least the average consumer surplus value that the other households of the sample received. The average consumer surplus value was multiplied by the estimated trips or days that were omitted from the sample and added to the consumer surplus value of the stratified data to arrive at the total consumer surplus value.

In several cases two statistical demand curves were estimated for the two partitions of the sample (e.g., those households taking less than 6 trips per year and those households taking 6 or more trips per year). However, these curves were never selected as the "best" estimates when computing resource values.

Statistical Demand Curve for Luna Lake

Eight alternative forms for the dependent variable were tested with the quadratic demand equation in an attempt to find both significant and stable cost coefficients. The "best" selection from each of the eight alternative forms are listed in Table 43. Data listed are the regression coefficients for the independent variables, their "t" values, the number of observations in the sample, and R^2 values for each "best" selection.

One step with its associated coefficients was selected as "best" from each of the eight alternative ways of running the 12 variable stepwise program. Criteria for "best" selection were a negative sign for variable 1 (average cost), significant "t" values for as many variables as possible but especially for variable 1, inclusion of variables 3 and 4 (distance) when possible, and a reasonably large R^2 value, considering the former criteria. The R^2 values attained in this study may seem very low when compared to studies that used aggregated variables in their estimation models. Brown and Nawas (1973) point out that the higher R^2 values for average data are misleading since the increased correlation among several explanatory variables resulting from aggregation lead to problems of multicollinearity which in turn leads to losses in estimating efficiency. The intent of this study is not in obtaining high R^2 values, but rather in the precision and efficiency of the estimated structural parameters, such as cost.

The blank spaces in Table 43 indicate that additional steps in the stepwise regression to include more variables either reduced the "t"

Table 43. Regression Results of Various Forms of Statistical Demand Equations - Luna Lake.

Selection	Dependent Variable	Regression Coefficients of Independent Variables[a]												Number of Observations	R^2
		1	2	3	4	5	6	7	8	9	10	11	12		
	Trips Per Year														
1.	All trips	-.006618 (1.91)	.000016 (1.31)					-.319084 (1.96)	.007262 (1.22)	.001447 (0.96)				451	.05
2.	All single trips excluded	-.034005 (3.12)	.000113 (2.41)			-.037088 (2.13)		-.238236 (2.86)		.019702 (1.49)	-.000053 (1.29)	-.015313 (0.96)		147	.14
3.	Two to five trips	-.011228 (2.13)	.002999 (1.53)	.001321 (1.65)	-.000001 (1.41)			-.184011 (1.34)	.004180 (0.77)	.009703 (1.87)	-.000025 (1.60)	-.009952 (1.00)	.000036 (0.57)	134	.12
4.	First trips excluded	-.019076 (3.08)	.000057 (2.41)			-.053499 (0.79)	.000475 (0.66)	-.155629 (3.27)						267	.08
	Days Per Year														
5.	All Days	-.218967 (4.62)	.001382 (2.60)	.014862 (6.87)	-.000006 (3.67)	-.445659 (2.89)	.005806 (3.49)	-.023470 (4.17)	.071816 (3.54)	.008191 (1.54)			.000471 (2:42)	451	.28
6.	Nine or more days excluded	-.020178 (3.04)		.005576 (9.38)	-.000002 (5.01)	-.105200 (2.16)	.001357 (2.53)				.000008 (1.91)	-.029412 (1.05)	.001375 (1.40)	337	.32
7.	Nine or more days	-.598854 (2.64)	.008751 (1.81)	.017546 (2.38)	-.000008 (1.40)	-.779671 (2.03)	.008730 (2.21)	-6.07389 (4.52)	.227080 (4.17)		.000055 (1.26)			114	.34
8.	First trips excluded	-.302743 (4.46)	.001700 (2.43)	.018323 (5.28)	-.000007 (2.87)	-.561675 (2.36)	.007141 (2.77)	-3.69827 (4.56)	.124922 (4.05)	.033795 (1.22)	-.000088 (1.11)	.024616 (0.43)	.000354 (0.88)	267	.33

[a]See Table 42 for variable definitions. Student t values are in parentheses; blank spaces indicate that additional steps in the stepwise regression to include more variables reduced the "t" values on the cost variables, affected the sign of the cost variables adversely, or did not improve the overall results significantly.

values for the cost variables, affected the sign of the cost variables adversely, or otherwise did not improve the overall results significantly.

A negative sign on variable 1 (average cost) is essential in estimating the second demand curve that actually describes the demand for the specific site. For all the selections shown in Table 43, the sign is negative and significant for variable 1. Variable 2, the cost squared variable, is always positive and is highly significant for most selections. Thus, the statistical demand curve is nonlinear and convex to the origin. Selections 5 through 8, where days taken at the site per year was the dependent variable, showed better results than selections 1 through 4 which attempted to explain trips per year to the site.

Variable 3, roundtrip mileage from place of residence to the site, was highly significant in most selections where the dependent variable was "days" per year and had a positive value. This same variable was insignificant when related to "trips" per year. Since a large proportion of the cost of transportation depends upon the distance from the place of residence to the site and since transportation comprises a large part of the total variable costs, one might expect a negative sign on the distance variable. Negative signs on the distance variable were reported by Brown and Nawas (1971) and Martin, Gum, and Smith (1973) in their research on the economics of hunting and fishing. Knetsch (1963) and Cesario and Knetsch (1970) point out that the time required for travel is a constraint on the number of visits made to a site and its exclusion from the model underestimates the number of visits made to a site and thus also underestimates the value of the resource. In the works of Brown and Nawas (1971) and Martin, Gum, and Smith (1973),

distance was interpreted as an additive cost decreasing the number of trips taken to a site.

The positive sign of the distance variable when related to days and the variable's insignificance when related to trips shows that relative to Luna Lake the major population centers are many miles distant and very few trips were taken during the year by individual households. (Refer to Tables 10 and 11 in Chapter IV for information concerning site and household characteristics.) The site is not used primarily for weekend recreation, but rather for longer periods of time. Knetsch (1963) points out that when sites are more distant from places of residence and where longer vacation trips are prevalent, travel time can be traded off for length of stay at the area and thus negate the importance of the distance variable. Inclusion of the distance variable when specifying the model tends, in this case, to make the coefficient on variable cost (variable 1) larger, increasing the significance of increased variable costs. In the research conducted by Brown and Nawas (1971) and Martin, Gum, and Smith (1973), where trips was the dependent variable, inclusion of the distance variable tended to make the cost coefficient smaller since distance itself was an important part of the cost of each individual trip.

Variable 5, age of head of household, was usually significant with a negative sign, while the square of the variable (variable 6) was positive. Thus, as the age of the head of household increased the number of days spent at this site decreased, but at a decreasing rate.

Variables 7 and 8, education of head of household, showed high significance with signs indicating that fewer days spent at this site were associated with higher levels of education.

Variables 9 through 12, the total yearly income of the household, and days of paid vacation per year of the head of household, usually were not significant under any of the selections.

Having specified and estimated statistical demand functions for this site, net economic values are estimated by the second step in the Clawson-Hotelling approach to recreation demand.

Net Economic Values for Luna Lake

Several of the demand equation selections giving good statistical results are used to generate net economic values for the recreation resource. Table 44 shows the estimates of net economic values for Luna Lake using selections 1, 4, 5, and 8 from Table 43. Taking into consideration the significance and stability of the cost coefficients, the number of observations in the sample, the R^2 values and the nondiscriminating monopolist price, selection 5 was chosen as "best" estimate of the value of the recreation resource.

The consumer surplus value, generated in the manner described earlier, estimates the value of this resource to be $1,117,539. This value shows the total benefit to recreators associated with this site, assuming a zero entry fee and 42,751 days taken at this site during the year 1972.

The nondiscriminating monopolist value chosen as "best" is $483,322. This value was selected as follows: Using selection 5 from

Table 44. Estimates of Net Economic Value Using Different Equation Forms - Luna Lake, 1972.

	Selections from Table 43	Nondiscriminating Monopolist Price Dollars Per Trip	Dollars Per Day	Nondiscriminating Monopolist Value ($)	Consumer Surplus Value ($)
	Trips Per Year				
1.	All trips	145		890,690	1,457,740
4.	First trips excluded;				
	value with first trips included	105[a]		518,750	965,864
	value with first trips excluded	105		383,825	714,613
	Days Per Year				
5.	All days[b]		27	483,322	1,117,539
8.	First trips excluded;				
	value with first trips included		66[a]	722,008	1,539,876
	value with first trips excluded		66	563,806	1,224,396

[a]Price was computed from equations with first trips excluded.

[b]Selection chosen as "best."

Table 43, Table 45 shows the associated number of days of recreation and revenues that could have been obtained if alternative entry fees into the site had been charged to a household unit desiring to recreate at this site. This schedule is merely the data from alternative points along the demand curve for the recreation activity.

According to this table, in 1972, an estimated 42,751 household days were taken by recreationists at Luna Lake. In the prior chapter it was pointed out that a certain amount of variable expenditures were associated with the number of trips and days that recreators took to this site. However, there was virtually no entry fee to this site, therefore, the added costs were zero. Had the U.S. Forest Service imposed a $10 a day entry fee, it is estimated that households would have only spent 32,094 days recreating at this site in 1972. Revenues totalling $320,939 would have been collected had this $10 fee been charged.

If the fees had been incrementally increased, the number of days taken by households to this site would have steadily declined until at the maximum fee of $67 per day no days would have been taken. Total revenues would have increased as the entry fee was raised up to a fee of $27 where total revenue showed to be at a maximum. Any additional increases in fees would have resulted in lower revenues. In the price range above $27, the demand for recreating at this site is "elastic," i.e., higher entry fees result in fewer days taken at this site and consequently lower revenues. In the price range below $27, the demand for recreating at this site is "inelastic," i.e., higher entry fees result in fewer days taken but greater revenues received.

Table 45. Estimates of Resource Values for Luna Lake at Alternative Added Costs, 1972.

Added Cost Per Day ($)	Number of Household Days Per Year	Total Revenue ($)
0	42,751	0
5	37,087	185,434
10	32,094	320,939
15	27,499	412,487
20	23,226	464,579
25	19,273	481,837
27	17,901	483,322[a]
30	15,968	479,026
35	12,791	447,680
40	10,110	404,407
45	7,687	345,925
50	5,909	295,459
55	4,206	231,348
60	1,894	113,625
65	616	40,406
67	0	0

[a]Nondiscriminating monopolist value.

The maximum total revenue that could be collected by a single monopolistic owner of the resource, the "nondiscriminating monopolistic value," occurs at the price of $27 where the elasticity of the demand curve is unitary.

Statistical Demand Curve for Black Canyon Lake

The "best" selection of seven of the many alternative forms of the statistical demand equation for Black Canyon Lake are listed in Table 46. For four of the seven selections in Table 46, the cost variable (variable 1) is negative, but only for selection 6 and 7 is the cost variable both negative and significant.

Variable 3, round trip mileage from place of residence to the site, showed inconsistent results. For selection 3, where first-trip households were excluded, the distance variable was both negative and significant, similar to the results reported by Brown and Nawas (1971) and Martin, Gum, and Smith (1973). The selection was not acceptable for estimating the value of the resource since the cost variable was both positive and insignificant. Selections 1 and 2, having trips as the dependent variable, were negative but not significant. Selection 4, having trips as the dependent variable, and selections 6 and 7, having days as the dependent variable, were positive and significant, similar to the results obtained for Luna Lake. Selection 5 having days as the dependent variable was positive but not significant.

Variables 5 and 6, age of head of household, were not significant with any of the selections.

Table 46. Regression Results of Various Forms of Statistical Demand Equations - Black Canyon Lake.

Selection	Dependent Variable	Regression Coefficients of Independent Variables[a] 1	2	3	4	5	6	7	8	9	10	11	12	Number of Observations	R^2
	Trips Per Year														
1.	All trips	.042573 (1.78)	-.000287 (1.88)	-.001309 (0.70)		-.059404 (0.56)	.000723 (0.62)	.697311 (1.30)	-.027878 (1.42)	.025903 (1.95)	-.000077 (2.04)	-.029738 (1.08)	.000095 (1.17)	360	.03
2.	Six or more trips			-.037159 (1.44)	.000064 (1.22)	-.846970 (1.33)	.007862 (1.08)	-12.3094 (1.71)	.493047 (1.82)		-.000156 (1.48)	-.365468 (0.97)	.013497 (0.86)	37	.34
3.	First trips excluded	.062503 (1.66)	-.000453 (1.48)	-.014380 (1.83)	.000024 (1.42)	-.024024 (1.41)	.002570 (1.34)			.029468 (1.42)	-.000090 (1.48)			216	.04
4.	Trips of less than 75 miles excluded	-.017432 (0.70)	.000009 (0.60)	.017044 (1.91)	-.000012 (1.44)	.064530 (0.54)	-.000880 (0.66)	1.40040 (1.90)	-.058466 (2.11)	.002387 (0.50)		-.043226 (1.32)	.000139 (1.51)	184	.08
	Days Per Year														
5.	All Days	-.047806 (0.58)	.000504 (0.36)	.007808 (1.21)	.000008 (0.70)	-.039283 (1.17)			-.008242 (1.34)			-.038553 (0.73)	.000324 (2.09)	360	.09
6.	Nine or more days excluded	-.030897 (3.01)		.005378 (6.95)				-.037693 (0.99)		.007362 (1.28)				308	.15
7.	Trips of less than 75 miles excluded	-.138061 (2.68)		.069722 (3.45)	-.000045 (2.31)			2.42633 (1.50)	-.101715 (1.65)			-.074593 (1.02)	.000411 (2.01)	184	.21

[a]See Table 42 for variable definitions. Student t values are in parentheses; blank spaces indicate that additional steps in the stepwise regression to include more variables reduced the "t" values on the cost variables, affected the sign of the cost variables adversely, or did not improve the overall results significantly.

Variable 7 and 8, education of head of household, were marginally significant using selection 2 with signs indicating that fewer trips taken to this site were associated with higher levels of education. Selection 4 indicated that education was significant but positive. For all other selections, variables 7 and 8 were insignificant.

Variables 9 through 12, the total yearly income of the household and days of paid vacation per year of the head of household, usually were not significant under any of the selections.

Having specified and estimated statistical demand functions for this site, net economic values are estimated in the manner described earlier, using selections 6 and 7.

Net Economic Values for Black Canyon Lake

Table 47 shows the estimates of net economic values for Black Canyon Lake using selections 6 and 7 from Table 46. Reasons for using partitioned samples and criteria for determining best estimates of the resource value were discussed earlier.

Using selection 7 as the "best" estimate, the consumer surplus method estimates the value of this resource to be $772,413. The consumer surplus value gives the total benefit to recreators using this site at a zero entry fee. Selection 7 was chosen as "best" over selection 6 since excluding nine or more days is a rather arbitrary partition of the sample while excluding trips of 75 miles or less is a decision based on reason. Trips of 75 miles or less were side-trips to the site while trips of more than 75 miles were made basically with Black Canyon Lake as the major point of destination. It was assumed that the

Table 47. Estimates of Net Economic Value Using Different Equation Forms - Black Canyon Lake, 1972.

Selections from Table 46	Nondiscriminating Monopolist Price Dollars Per Day	Nondiscriminating Monopolist Value ($)	Consumer Surplus Value ($)
Days Per Year			
6. Nine or more days excluded;			
value with nine or more days included	75[a]	452,664	1,160,454
value with nine or more days excluded	75	196,089	502,790
7. Trips of less than 75 miles excluded;[c]			
value with trips of less than 75 miles included	47[b]	270,591	772,413
value with trips of less than 75 miles excluded	47	149,708	427,286

[a]Price was computed from equations with 9 or more days excluded.

[b]Price was computed from equations with trips of less than 75 miles excluded

[c]Selection chosen as "best."

households that were excluded from the statistical equation received at least an average consumer surplus of $42.14 per household-day. Thus, the two estimates including and excluding trips of 75 miles or less should bracket the "true" value.

Total household days spent at this site during 1972 were 18,330. Households that traveled more than 75 miles one way to the site took 10,140 days at Black Canyon Lake. Based on data from the partitioned sample, the U.S. Forest Service could have received revenues of $43,861 had they charged a $5 entry fee to those households traveling more than 75 miles, and thus presumably had this site as their major destination. Table 48 shows the associated number of days of recreation and revenues that could have been obtained from those households that traveled a distance of more than 75 miles to the site, had alternative entry fees been charged. The nondiscriminating monopolist price of $47 yields revenues of $149,708, with the associated number of days equaling 3,185.

This same $47 price would reduce total household days per year to 5,575 and yield revenues of $270,591 with the assumption that households traveling 75 miles or less to the site react to changes in prices similarly to those households traveling more than 75 miles to the site. This assumption probably yields an overestimation of days and value.

Statistical Demand Curve for Knoll Lake

For Knoll Lake, the "best" selection of three of numerous alternative forms of the statistical demand equation are listed in Table 49. Only selections using days as the dependent variable are shown. Selections using trips as the dependent variable were totally unsatisfactory.

Table 48. Estimates of Resource Values for Black Canyon Lake at Alternative Added Cost, 1972.

Added Cost Per Day ($)	Number of Household Days Per Year [a]	Total Revenue [a] ($)	Number of Household Days Per Year [b]	Total Revenue [b] ($)
0	10,140		18,330	
5	8,772	43,861		
10	7,618	76,180		
15	6,659	99,884		
20	5,881	117,624		
25	5,201	130,030		
30	4,607	138,204		
35	4,143	145,008		
40	3,713	148,535		
45	3,320	149,395		
47	3,185	149,708[c]	5,757	270,591[c]
50	2,983	149,167		
75	1,716	128,732		
100	974	97,409		
150	378	56,673		
200	193	38,517		
250	43	10,751		
276	0	0		

[a]Based on a sample of households that traveled a one way distance greater than 75 miles from point of origin to site.

[b]Based on total sample

[c]Nondiscriminating monopolist value.

Table 49. Regression Results of Various Forms of Statistical Demand Equations - Knoll Lake.

Selection	Dependent Variable	Regression Coefficients of Independent Variables[a]												Number of Observations	R^2
		1	2	3	4	5	6	7	8	9	10	11	12		
	Days Per Year														
1.	All days	-.062990 (2.84)	.000025 (2.80)	.009960 (2.68)	-.000003 (0.64)		-.000378 (1.83)	-1.56718 (3.19)	.046775 (2.69)	.019699 (1.59)	-.000051 (1.40)	.026578 (1.20)	-.000038 (1.32)	662	.07
2.	Nine or more days excluded	-.044880 (5.70)	.000018 (5.66)	.004778 (3.63)	-.000002 (1.25)	-.032010 (0.91)	.000299 (0.72)		.000156 (0.17)		-.000002 (0.58)	.002085 (0.26)	-.000004 (0.43)	585	.09
3.	First trips excluded	-.137405 (1.51)	.001653 (0.88)	.012606 (4.14)		.038377 (0.24)	-.000945 (0.51)	-2.57238 (3.24)	.079635 (2.75)	.035597 (1.77)	-.000097 (1.62)	.062623 (1.69)		373	.11

[a]See Table 42 for variable definitions. Student t values are in parentheses; bland spaces indicate that additional steps in the stepwise regression to include more variables reduced the "t" values on the cost variables, affected the sign of the cost variables adversely, or did not improve the overall results significantly.

For two of the three selections listed in the table, the cost variable is both negative and highly significant, a necessary condition in order to estimate the second demand curve describing the demand for the specific site. Variable 2, the cost squared variable is positive and highly significant. Thus, the statistical demand curve is nonlinear and convex to the origin.

Variable 3, round trip mileage from place of residence to the site, was highly significant for all three selections. The sign on the variable was positive since days was the dependent variable, making the cost coefficient larger and increasing the significance of increased variable cost by the inclusion of distance in the model.

Variables 5 and 6, age of head of household, were not significant for any of the selections.

Variables 7 and 8, education of head of household, were highly significant with selections 1 and 3 having signs indicating that fewer days spent at this site were associated with higher levels of education. For selection 2, the variables were not significant.

Variables 9 and 10, total yearly income of the household and variables 11 and 12, days of paid vacation per year of the head of household, were not significant under any of the selections.

Having specified and estimated the statistical demand functions for Knoll Lake, net economic values are estimated in the manner described for Luna Lake.

Net Economic Values for Knoll Lake

All three demand equation selections listed in Table 49 were used to generate the estimates of net economic values for Knoll Lake

shown in Table 50. Selection 2 was chosen as the "best" estimate of the value of the recreation resource for the following reasons. First, the coefficients on the two cost variables have the highest "t" values and the "t" values on the distance variables are also high. Therefore, selection 2 is probably better than selection 3. Selection 2 appears obviously better than selection 1 when the implied values are computed as displayed in Table 50. The aggregate second-stage demand function did not reach the price axis before an added cost of $1,000, the maximum added cost used in the estimation procedure. Thus, the implied consumer surplus value (if estimated) would be extremely large and the implied nondiscriminating monopolist value and price is inordinately high.

The value of this resource estimated by the consumer surplus method with selection 2 is $861,750. This estimate includes those households that took nine or more days at this site with apparent disregard to cost. Although they were not included in the statistical demand curve, it was assumed that this group of households received an average consumer surplus value of $46.93 per household-day (the average of the under-nine-day households) when computing the value of the resource. Thus, this value may be an underestimate of the total value.

During the 1972 outdoor recreation season total household-days spent at this site were 18,363. Households that took fewer than 9 days at this site spent a total of 10,914 days during the 1972 recreation season. An increase in the entry fee above the present $1 per day would have reduced the number of household days and increased the revenues collected from the fee. Table 51 shows the associated number of household-days of recreation and revenues that could have been obtained from

Table 50. Estimates of Net Economic Value Using Different Equation Forms - Knoll Lake, 1972.

Selection from Table 49	Nondiscriminating Monopolist Price Dollars Per Day	Nondiscriminating Monopolist Value ($)	Consumer Surplus Value ($)
Days Per Year			
1. All days	115	492,909	a
2. Nine or more days excluded;[d]			
value with nine or more days included	40[b]	338,414	861,750
value with nine or more days excluded	40	201,054	512,232
3. First trips excluded;			
value with first trips included	49[c]	275,186	847,708
value with first trips excluded	49	212,515	654,033

[a]Implied value was unreasonably high and was not precisely estimated.

[b]Price was computed from equations with nine or more days excluded.

[c]Price was computed from equations with first trips excluded.

[c]Selection chosen as "best."

Table 51. Estimates of Resource Values for Knoll Lake at Alternative Added Costs, 1972.

Added Cost Per Day ($)	Number of Household Days Per Year[a]	Total Revenue[a] ($)	Number of Household Days Per Year[b]	Total Revenue[b] ($)
0	10,914	0	18,363	
5	10,079	50,396		
10	9,261	92,606		
15	8,445	126,681		
20	7,634	152,670		
25	6,903	172,573		
30	6,275	188,244		
35	5,649	197,725		
40	5,026	201,054[c]	8,460	338,414[c]
45	4,406	198,271		
50	3,958	197,901		
75	2,109	158,179		
100	1,118	111,774		
125	627	78,431		
150	290	43,443		
175	122	21,401		
204	0	0		

[a]Based on a sample of households taking eight or fewer days per year at this site and representing 88.4 percent of the sample households.

[b]Based on the total sample.

[c]Nondiscriminating monopolist value.

those households taking one to eight days per year at Knoll Lake, had alternative entry fees been charged. Based on the partitioned sample, a $5 entry fee would have decreased the number of household-days to 10,079 but raised the revenues to $50,396. The nondiscriminating monopolist price of $40 yields revenues of $201,054 for those households visiting less than nine days per year. This same $40 price would reduce total household days per year to 8,450 and yield revenues of $338,414 if it can be assumed that those households taking more than eight days at this site per year react to changes in entry fees similarly to those households taking fewer than nine days per year.

A common complaint of many of the questionnaire respondents and several personal observations noted that during the peak season Knoll Lake was overcrowded. Since the lake and camping area is overcrowded at zero added cost, some positive level of added cost with fewer visitors might well be considered as a policy suggestion, even if the U.S. Forest Service is uninterested in raising additional revenues.

Statistical Demand Curve for Horsethief Basin

The "best" selection of four of the many alternative forms of the statistical demand equations computed are listed in Table 52. Of the four selections, only Selection 4 shows the cost variable (variable 1) to be both negative and significant. This selection deleted households that took nine or more days per year since this group apparently reacted with total disregard to cost as was the case at Knoll Lake.

Variable 3, round trip mileage from place of residence to the site, was not significant for any of the selections in Table 52. Since

Table 52. Regression Results of Various Forms of Statistical Demand Equations - Horsethief Basin.

Selection	Dependent Variable	Regression Coefficients of Independent Variables[a]												Number of Observations	R^2
		1	2	3	4	5	6	7	8	9	10	11	12		
	Trips Per Year														
1.	All trips	.040339 (1.78)	-.000121 (1.44)					1.41232 (1.68)	-.045308 (1.59)	-.011789 (0.75)	.000021 (0.46)	-.039426 (1.35)		293	.04
2.	Two to five trips	-.002095 (0.20)	.000020 (0.50)	.011098 (1.29)	-.000025 (1.11)	-.199726 (2.33)	.002597 (2.39)	.041540 (0.83)		.005616 (0.71)	-.000032 (1.25)		-.000290 (0.48)	61	.20
	Days Per Year														
3.	All days	-.062569 (0.37)	.002783 (0.67)	.032753 (0.85)	-.000050 (0.65)			.076229 (0.33)		.014930 (0.43)	-.000073 (0.74)	-.282247 (1.54)	.006857 (1.02)	293	.03
4.	Nine or more days excluded	-.162494 (4.07)	.004465 (3.24)	.002588 (0.40)	.000012 (0.94)	-.101592 (1.90)	.001134 (1.77)							258	.13

[a]See Table 42 for variable definitions. Student t values are in parentheses; blank spaces indicate that additional steps in the stepwise regression to include more variables reduced the "t" values on the cost variables, affected the sign of the cost variables adversely, or did not improve the overall results significantly.

almost 90 percent of the visitors to this site reside in the Phoenix metropolitan area, a short distance away, the distance variable is not a factor determining the number of days taken at this site per year.

Variable 5, age of head of household was significant with a negative sign in two of the selections, while the square of the variable (variable 6) was positive. Thus, as the age of the head of the household increased, the number of days or trips taken to the site decreased, but at a decreasing rate.

Variables 7 through 12, education of head of household, total yearly household income, and days of paid vacation per year of the head of household, were not significant for any of the selections.

Net Economic Values for Horsethief Basin

Only one of the demand equation selections gave sufficiently good statistical results to be used to generate net economic values for the recreation resource. The consumer surplus value generated with selection 4 was estimated to be $125,609. Households taking nine or more days at this site per year with total disregard to cost were not included in the statistical demand curve, but were assumed to receive at least an average consumer surplus of $9.85 per household-day in estimating the total net value of the resource. As a result, one must assume that valuing those high-use households at the average value would tend to underestimate the total value as was the case for Knoll Lake.

Total household-days taken at this site during the 1972 outdoor recreation season were estimated to be 12,750. Households grouped in the one to eight days per year category took 5,427 days at this site

during 1972. Table 53 shows the associated number of household-days of recreation and revenues that could have been obtained from those households taking eight or fewer days per year at this site, had alternative entry fees been charged. Table 53 reveals that, based on the partitioned sample, the highest revenues possible (nondiscriminating monopolist value of $27,549) are received at a $9 per household-day entry fee. This same $9 fee would reduce total household-days per year to 7,191 and yield revenues of $64,719 under the assumption that those households taking more than eight days at this site per year react to changes in entry fees in a similar manner as would those households taking fewer than nine days per year at the site. Therefore, the estimated nondiscriminating monopolist value is a conservative measure of the net worth of the recreation resource.

Brushy Basin-Four Peaks

Table 54 shows that for the Brushy Basin-Four Peaks area none of the statistical demand equations exhibited a significant and negative cost coefficient, a necessary condition in order to estimate net values using the second-stage of the Clawson-Hotelling analysis. All the R^2 values were extremely low, ranging from .01 to .09, indicating that the independent variables in the equation do not explain the variation in either the number of trips or days taken to this area by recreators.

As discussed earlier, Brushy Basin-Four Peaks is very near the Phoenix metropolitan area where 96 percent of its recreators reside. This proximity seems to negate the importance of time or money costs as explanatory variables to the number of trips or days taken to this

Table 53. Estimates of Resource Values for Horsethief Basin at Alternative Added Costs, 1972.

Added Cost Per Day ($)	Number of Household Days Per Year [a]	Total Revenue [a] ($)	Number of Household Days Per Year [b]	Total Revenue [b] ($)
0	5,427	0	12,750	
1	4,834	4,834		
2	4,618	9,236		
3	4,437	13,312		
4	4,173	16,692		
5	4,004	20,019		
6	3,803	22,820		
7	3,590	25,131		
8	3,389	27,113		
9	3,061	27,549[c]	7,191	64,719[c]
10	2,601	26,009		
15	846	12,697		
20	29	581		
25	26	642		
27	0	0		

[a]Based on a sample of households taking eight or fewer days at this site per year and representaing 88 percent of the sample households.

[b]Based on the total sample.

[c]Nondiscriminating monopolist value.

Table 54. Regression Results of Various Forms of Statistical Demand Equations - Brushy Basin-Four Peaks.

Selection	Dependent Variable	Regression Coefficients of Independent Variables[a] 1	2	3	4	5	6	7	8	9	10	11	12	Number of Observations	R^2
	Trips Per Year														
1.	All trips	.059719 (3.02)		.008069 (0.68)	-.000031 (1.02)		.054600 (0.92)	-.000825 (1.18)			-.000015 (2.14)			634	.03
2.	Two to five trips	.013312 (2.13)				-.016878 (0.75)	.000160 (0.60)			.003929 (1.14)	-.000013 (1.28)			265	.03
3.	Six or more trips	.025941 (2.71)		-.147174 (0.89)	.000143 (0.79)	1.02288 (1.43)	-.012190 (1.27)	3.91287 (1.26)	.133661 (1.12)		.000118 (1.55)		-.003354 (0.72)	67	.09
4.	First trips excluded	.053592 (2.26)				.064350 (0.72)	-.000937 (0.63)	.865734 (1.63)	-.031328 (1.71)	-.017643 (1.38)	.000028 (0.76)			447	.04
	Days Per Year														
5.	All days	.025344 (0.62)					-.000419 (1.85)	.698543 (1.31)	-.025403 (1.37)	-.003505 (0.91)				634	.01
6.	Nine or more days excluded	-.004387 (0.34)			.000003 (0.59)		-.000112 (1.67)	.198214 (1.23)	-.007354 (1.31)	.001082 (0.93)		-.021564 (0.91)	.000536 (0.57)	565	.01
7.	Nine or more days	.500260 (0.76)	-.014857 (0.75)	-.176086 (0.91)	.000443 (0.70)	1.20993 (1.24)	-.014991 (1.13)	4.80302 (1.41)	-.176030 (1.44)		-.000035 (0.38)	-.109615 (0.19)	-.000837 (0.04)	69	.09

[a]See Table 42 for variable definitions. Student t values are in parentheses; blank spaces indicate that additional steps in the stepwise regression to include more variables reduced the "t" values on the cost variables, affected the sign of the cost variables adversely, or did not improve the overall results significantly.

recreation area. In order to estimate net values for the recreation area utilizing the second-stage of the Clawson-Hotelling approach, a statistically significant cost variable having a negative sign is required. Since such a function could not be generated, a modification in method was devised.

Respondents had been asked how much they would be willing to pay for the use of the recreation area per day rather than be excluded. This willingness to pay information, along with other independent variables, was regressed upon days at the area per year in an attempt to improve the statistical demand estimate. The following equation was obtained:

$$Y = -2.2273 + \underset{(0.92)}{0.348037}X_1 + \underset{(0.03)}{0.001733}X_1^2 + \underset{(0.59)}{0.011263}X_2 - \underset{(0.04)}{0.000020}X_2^2$$
$$+ \underset{(0.53)}{0.059519}X_3 - \underset{(0.76)}{0.001060}X_3^2 + \underset{(1.45)}{0.793424}X_4 - \underset{(1.55)}{0.029426}X_4^2 - \underset{(0.71)}{0.010568}X_5$$
$$+ \underset{(0.40)}{0.000017}X_5^2 - \underset{(0.12)}{0.010068}X_6 + \underset{(0.07)}{0.000223}X_6^2 + \underset{(0.17)}{0.047377}X_7$$
$$- \underset{(0.15)}{0.001216}X_7^2$$

$R^2 = 0.02$

$n = 629$

Numbers in parentheses below the coefficients for the variables are the "t" values and the variables are defined as follows:

Y = number of days at site per year

X_1 = willingness to pay an entry fee into area per day

X_2 = average round trip distance from origin to recreation area

X_3 = age of head of household

X_4 = education of head of household

X_5 = family income

X_6 = annual paid vacation of head of household

X_7 = days off per month of head of household

This formulation did not improve the statistical demand estimate. The signs on the cost coefficients were both positive and insignificant.

It was concluded that instead of having a measure of demand for the area, the positive relationship between willingness to pay and actual days visited formulated a measure of tastes and preferences. Willingness to pay was directly related to the number of days or trips that households took to this recreation area in a manner shown in Figure 9.

Using the Clawson-Hotelling approach to estimating a statistical demand curve was abandoned. The willingness to pay information was applied to an approach to valuing recreation resources described earlier as the "direct" technique. This approach attempts to establish a demand curve by asking households how much of an entry fee they would be willing to incur for the use of the recreation site rather than to be excluded (Knetsch and Davis, 1966).

This method of estimating recreational benefits may not be as reliable as the method applied to the other sites due to the hypothetical nature of the questions which can result in biased answers from the respondents. It is quite possible that a respondent unconsciously or deliberately understates his preference for a recreation site in the hope that by doing so, if a fee actually ever is charged, the charge would be smaller than the amount that he is actually willing to pay.

The method devised to determine a demand and value for the resource was as follows. A table consisting of the number of sample households, the number of days taken at the site per year and the

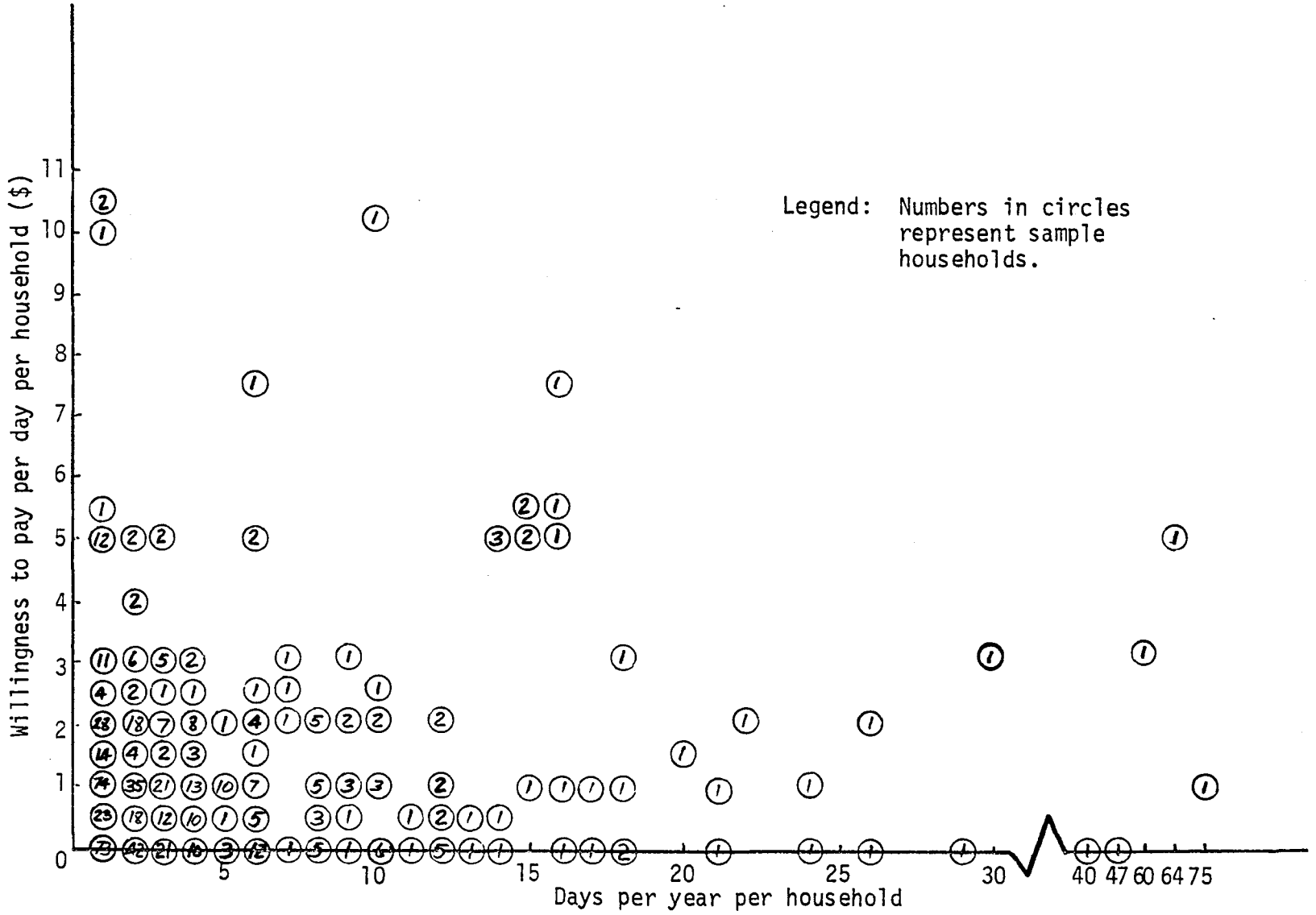


Figure 9. Scatter of Willingness to Pay and Days Per Year at Brushy Basin-Four Peaks in 1972.

willingness to pay an entry fee per day was developed. At each willingness to pay level, the number of households was multiplied by the corresponding number of days taken at the site per year. The responses of willingness to pay were then arrayed and cumulated downward. The sample data were expanded by the appropriate blowup factor and the result was a schedule of demand relating the number of total days household units would take at this area per year to their maximum willingness to pay an entry fee into the area. Results of this schedule are shown in columns 1 and 2 of Table 55. When these data were subjected to multiple regression analysis, the following equation was obtained:

$$Y_D = 6163 - \underset{(9.10)}{1817.50X_1} + \underset{(6,80)}{124.86X_1^2}$$

$R^2 = 88$

Y_D = estimated days per year

X_1 = willingness to pay

Figure 10 depicts the scatter of points and the estimated least squares regression curve. From the regression equation, the consumer surplus value can be determined directly as the integral under the demand curve.

$$\hat{Y}_{D_0} \int^{5.50} (6163 - 1817.50X_1 + 124.86X_1^2)\, dX_1$$

Consumer surplus = $13,321

The curve developed by least squares regression does not fully describe the demand relationship in that the curve meets the "willingness to pay" axis at $5.50 rather than at $11.00 and the "days" axis at 6,163 days rather than at total estimated days of 8,195 at zero added cost. A

Table 55. Schedule of Willingness to Pay and Associated Number of Days Taken by Households at Brushy Basin-Four Peaks in 1972.

Willingness to Pay (Dollars Per Day)	Total Household Days Per Year
0	8,195
.50	5,489
1.00	4,574
1.50	2,395
2.00	2,242
2.50	1,239
3.00	1,113
3.50	749
4.00	749
4.50	735
5.00	735
5.50	119
6.00	116
6.50	116
7.00	116
7.50	116
8.00	43
8.50	43
9.00	43
9.50	43
10.00	43
10.50	7

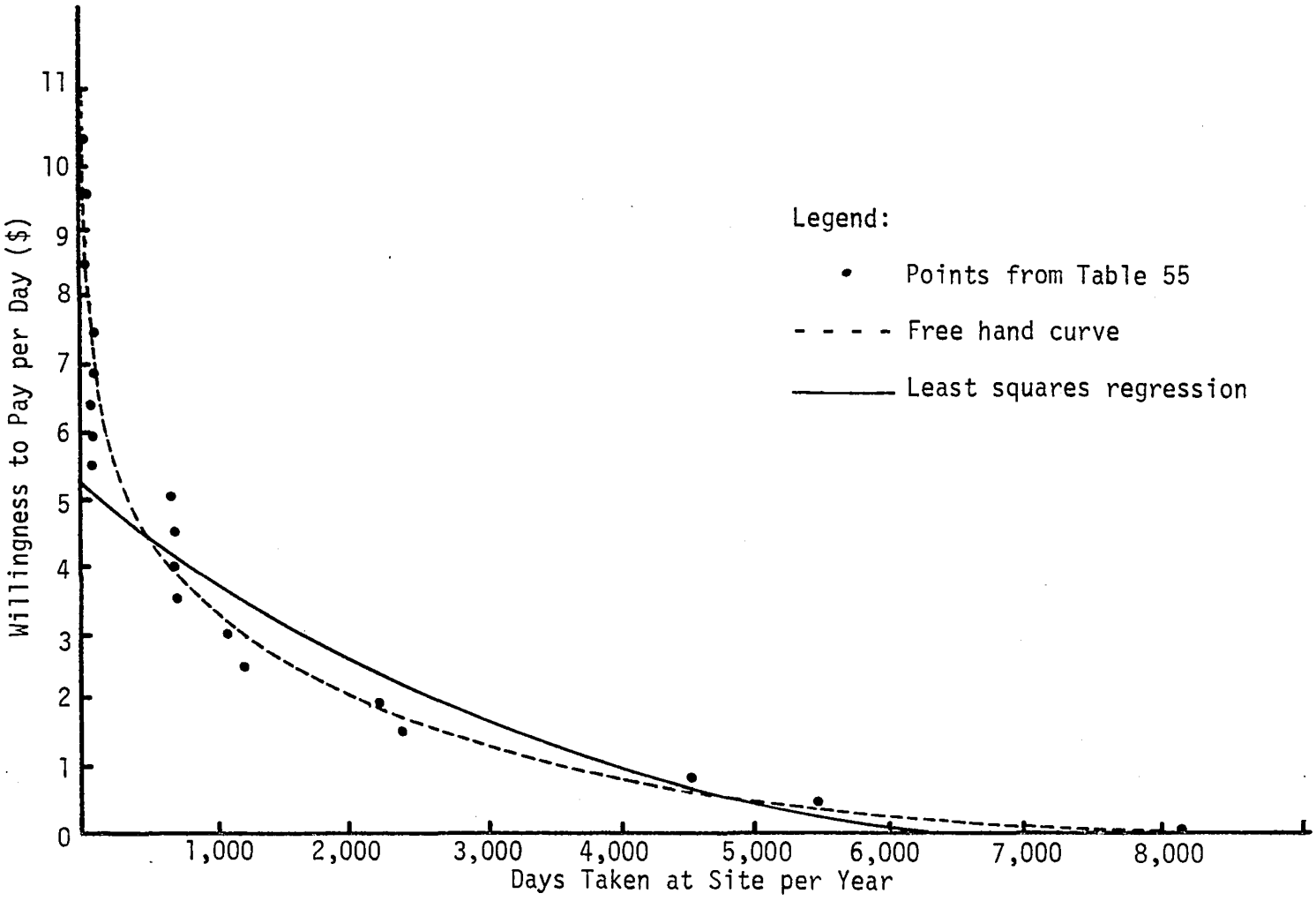


Figure 10. Regression Equation and Free Hand Curve for Willingness to Pay and Days Taken per Year at Brushy Basin-Four Peaks, 1972.

free hand curve was drawn (see Figure 10) and the area under the curve was evaluated mechanically. Using this evaluation method, the consumer surplus value was $12,200, very similar to the value obtained from the definite integral.

These values are extremely low when compared to the variable expenditures that were incurred by households visiting Brushy Basin in 1972 and when compared to the values obtained for the other selected representative sites. It is recognized that in using this method for valuing a resource, respondents to the willingness to pay questions may understate their preferences for the resource in order to avoid the possibility of high entry fees. The maximum willingness to pay price did not exceed $10.50, whereas the maximum price surrogate used with the Clawson-Hotelling approach to valuing resources often exceeded several hundred dollars. Therefore, the value derived for Brushy Basin-Four Peaks by way of the "direct" approach must be assumed to be a minimum value.

The nondiscriminating monopolist value was estimated from the least squares regression curve to be $6,000 with an associated entry fee of $2 per household per day. The free hand curve method implies a nondiscriminating monopolist value of $4,200, also with an associated entry fee of $2 per household per day. Estimates of resource values at alternative added costs, developed from the free hand curve are presented in Table 56.

Table 56. Estimates of Resource Values for Brushy Basin-Four Peaks at Alternative Added Costs, 1972.

Added Cost Per Day ($)	Number of Household Days Per Year	Total Revenue ($)
0	8,195	0
1	3,700	3,700
2	2,100	4,200[a]
3	1,300	3,900
4	700	2,800
5	350	1,750
6	225	1,350
7	100	700
8	80	640
9	50	450
10	25	250
11	0	0

[a]Nondiscriminating monopolist value.

CHAPTER VII

SUMMARY AND CONCLUSIONS

The intent of this study has been to investigate the demand for and value of outdoor recreation in the Salt-Verde Basin of Arizona with the purpose of aiding the U.S. Forest Service in its efforts to efficiently administer the Salt-Verde Basin as outlined in the Multiple Use Sustained Yield Act of 1960.

Since several products can be produced from this resource base, the economic problem becomes one of maximizing the value of product-output relative to a given cost. Since demand functions for all other products except outdoor recreation have been either directly or indirectly estimated, it was the task of this research to develop demand functions and to determine the value of the resource in recreational use.

It was not feasible to study each of the sites within the eight million acre Basin. Therefore, the concept of the "representative site" was adopted. Each representative site was viewed as a stand-in for a similar site within the Basin.

The number of sites selected for study was constrained by the available time of the researcher and the size of the Forest Service grant of funds. As a result, all types of sites may not have been represented. However, an effort was made to select a variety of sites with respect to vegetative type, recreational activities, and location relative to major population centers. The five sites selected for study were Brushy

Basin-Four Peaks in the Tonto National Forest, Horsethief Basin in the Prescott National Forest, Knoll Lake in the Coconino National Forest, Black Canyon Lake in the Sitgreaves National Forest, and Luna Lake in the Apache National Forest.

In order to generate the required data a mail survey of households that visited the selected representative sites in the Basin was conducted. Over 5,000 questionnaires were mailed throughout the 1972 outdoor recreation season. Overall response to the questionnaires was 51 percent.

As a measure of gross economic activity, gross variable household expenditures were compiled from the sample data. The largest portion of expenditures were incurred for transportation, ranging from 37 percent at Luna Lake to 53 percent at Brushy Basin-Four Peaks. The majority of the households visiting the selected sites resided in the Phoenix metropolitan area. The exception was Luna Lake, where over 33 percent of the site's users originated from out-of-state. Households residing in the Phoenix metropolitan area incurred a low of 23 percent of all expenditures at Luna Lake and a high of 96 percent of all expenditures at Horsethief Basin. Households visiting sites that are relatively close to the point of origin in terms of travel time, take more trips and stay fewer days at a site than households visiting sites that are located a long distance from a household's place of residence.

In order to accomplish the basic objective of determining values for the several representative sites, it was assumed that the user costs associated with a recreation activity provide a valid substitute for the price of a recreational experience. Traditional demand theory can be

applied to outdoor recreation by defining the demand as the amount of recreational activity that will be taken by households at various levels of user expenditures. This demand function can be expressed by a statistical demand estimate which can be used in deriving values for the recreation resource.

In this study, the modifications of method introduced by Brown and Nawas (1971) to the Clawson-Hotelling procedure for estimating recreation values were employed. Additional modifications and alterations were made when these changes brought about improvements in the results. With this procedure for estimating recreational values, individual observations were used to derive individual household demand functions defining the number of trips or days a household took at a specific site per year and the associated variable costs. Variable costs are the principal determinants of outdoor recreation activity undertaken during a year. These costs and demand-shifter variables were then aggregated and expanded by the proper blow-up factor to arrive at a demand function for the specific representative site.

The resulting statistical demand estimates were used to generate resource values by both the consumer surplus and nondiscriminating monopolist methods.

For one area, Brushy Basin-Four Peaks, an alternative approach to estimating a statistical demand curve had to be utilized since the data did not give significant results using the individual observation modification of the Clawson-Hotelling procedure. Instead, the "direct" technique was employed. This method attempts to estimate a demand function by asking households how much of an entry fee they would be willing to

incur for the use of the recreation site rather than be excluded (Knetsch and Davis, 1965).

The resultant net economic value estimates chosen as "best" estimates for each of the five representative sites, and the variable expenditures incurred by recreationists visiting these sites in 1972 are presented in Table 57. Luna Lake, a highly developed site with easy access, water-based recreation, and the furthest away from the Phoenix metropolitan area is shown to have the highest net values as well as inducing the greatest expenditures incurred by households. Brushy Basin-Four Peaks and Horsethief Basin, the two sites that were located nearest the Phoenix metropolitan area, had the most difficult access, and were virtually without any water-based recreation, had the lowest values and the smallest expenditures incurred by households.

It is apparent that higher net values and larger expenditures are associated with sites that have water-based recreation, a fair amount of development at the sites, fairly easy access, and are more than just a few hours drive from a major population center.

Table 57 also compares variable expenditures incurred by recreationists with the net values estimated for the resource using the individual observation technique. The nondiscriminating monopolist values tend to be smaller than the variable expenditures for Brushy Basin-Four Peaks and Horsethief Basin, where travel and other expenses are relatively minor. For Luna Lake, the nondiscriminating monopolist values are higher than the variable expenditures. For sites that are more distant from most households' places of residence, and therefore involve greater travel costs, and for sites having water-based recreation available, the

Table 57. Nondiscriminating Monopolist and Consumer Surplus Values Compared to Total Variable Expenditures Incurred by Households at the Selected Sites, 1972.

Site	Variable Expenditures ($)	Nondiscriminating Monopolist Value ($)	Consumer Surplus Value ($)
Luna Lake	520,711	483,322	1,117,539
Black Canyon Lake	191,871	270,591	772,413
Knoll Lake	231,908	338,414	861,750
Horsethief Basin	112,993	64,719	125,609
Brushy Basin-Four Peaks	60,108	6,000	13,321

monopolistic values tended to be greater than the variable expenditures. Similar results were reported by Martin, Gum, and Smith (n.d.) in their study of the economics of hunting and fishing.

Consumer surplus values were larger than the variable expenditures for all sites except Brushy Basin-Four Peaks where the individual observation modification to the Basin Clawson-Hotelling approach to estimating a site's statistical demand curve was not employed. The values shown for Brushy Basin-Four Peaks are considered to be underestimates of the true values.

Aggregate Values for the Entire Basin

Demand functions and estimated values were determined for only a few representative sites in the Salt-Verde Basin. A value for the entire Basin for recreation use can be estimated by using the values determined for the selected representative sites as a basis for valuing the other sites in the Basin.

All developed sites managed by the U.S. Forest Service within the Salt-Verde Basin were classified according to the amount of development at a site, the activities available, visitor use, and distance away from the Phoenix metropolitan area. These sites were then matched up as closely as was possible with the representative sites and the values assigned to them were totaled. Table 61, indicating under which representative site the remainder of the developed sites in the Basin were classified, is presented in Appendix C. Since no representative developed site was chosen for the southern portion of the Tonto National Forest, and since a great deal of outdoor recreation takes place in this

area, values for part of Arizona Game and Fish Management Region 5 were estimated from values derived by Martin, Gum, and Smith (n.d.). The nondiscriminating monopolist value for that portion of Region 5 was $8,178,868 and the consumer surplus value was $13,597,485. Values for portions of the Fort Apache Indian Reservation and the San Carlos Indian Reservation that are part of the Salt-Verde Basin were also estimated from values derived by Martin, Gum, and Smith (n.d.). These estimates are presented in Table 62 of Appendix C.

The nondiscriminating monopolist value estimated in the manner described above for the entire Salt-Verde Basin is $36,644,041. The consumer surplus value is estimated at $81,592,872 (see Table 58). These aggregate values do not include many of the dispersed recreation areas nor do they include the value of the Basin for hunting.

These estimates may be compared to estimates made for the entire state of Arizona for recreational use in the study by Martin, Gum, and Smith (n.d.). In the Martin, Gum, and Smith (n.d.) study, each Arizona Game and Fish Management Unit was considered a recreation site and values were estimated for activities by Game and Fish Management Regions, using units as the points of recreational destinations.

Figure 11 depicts the Arizona Game and Fish Management Regions (Regions are aggregates of many units) and an outline of the Salt-Verde Basin. Estimates of portions of these regions lying within the boundaries of the Salt-Verde Basin were computed from values generated by Martin, Gum, and Smith (n.d.) for general rural outdoor recreation, cold water fishing and warm water fishing, the major activities enjoyed at the representative sites. These values are presented in Tables 63 and 64

Table 58. Comparison by Sources of Total Value Estimates for the Salt-Verde Basin, 1972.

Type of Estimate	Nondiscriminating Monopolist Value ($)	Consumer Surplus Value ($)
Total Estimates for Basin Using Representative Sites		
Aggregate of Representative Sites[a]	20,509,827	54,838,997
Southeast Portion of Region 5[b]	8,178,868	13,597,485
Indian Reservations[c]	7,955,346	13,156,390
TOTAL	36,644,041	81,592,872
Total Estimates for Basin from Martin, Gum, and Smith (n.d.) (Excluding Hunting)[d]	37,312,126	63,276,010
Total Estimates for Basin for Hunting[e]	4,153,537	9,158,868

[a]See Table 61.

[b]Warm water lake area near Phoenix including Roosevelt, Saguaro, Apache, and Canyon Lake for warm water fishing and general rural outdoor recreation.

[c]See Table 62.

[d]See Tables 63 and 64.

[e]See Tables 65 and 66.

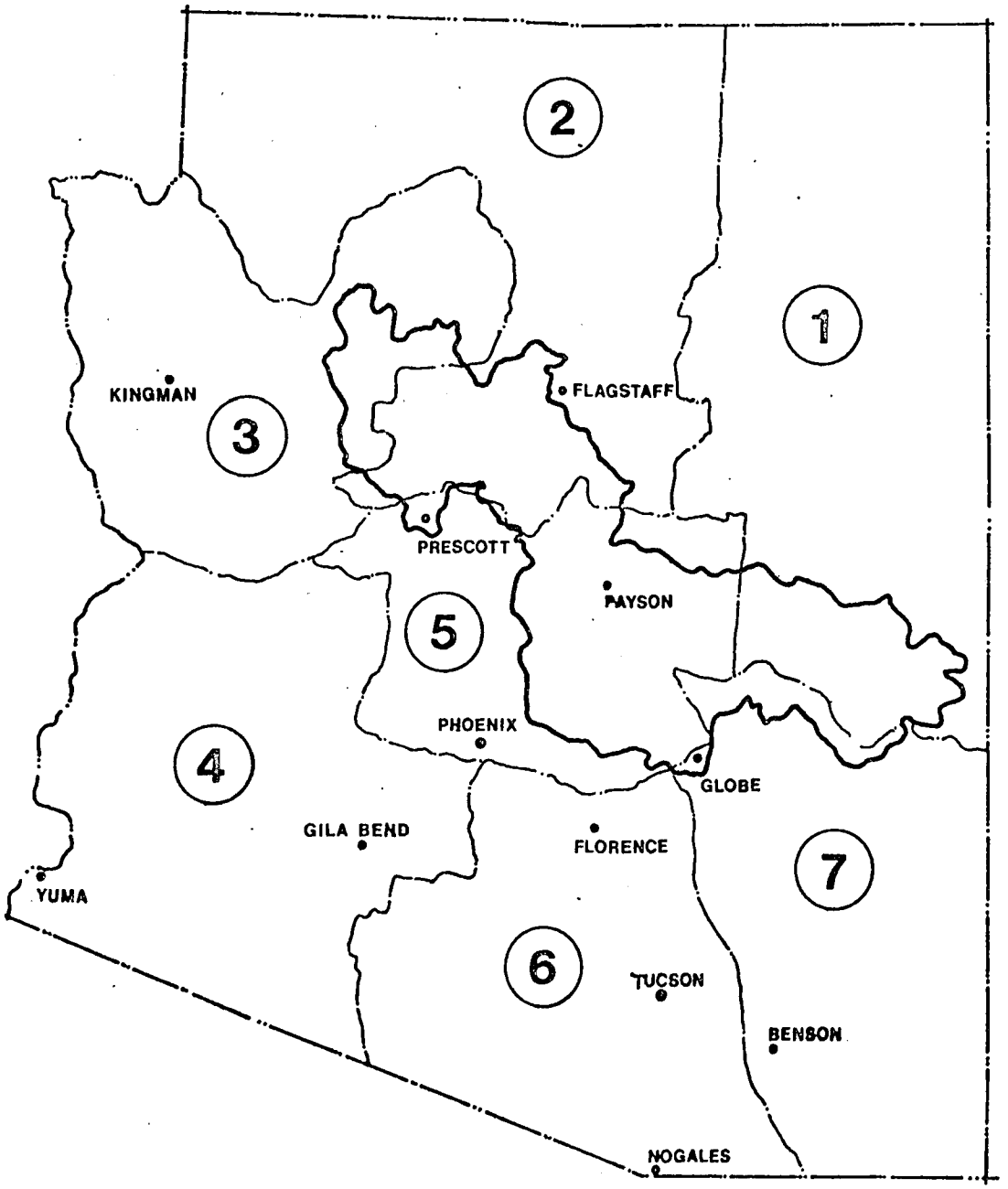


Figure 11. Outline of Arizona Game and Fish Management Regions and the Salt-Verde Basin, 1972.

of Appendix C. The nondiscriminating monopolist value was estimated at $37,312,126, only $0.7 million more than the value attained by utilizing the method of aggregating up from the values of the representative sites plus the balues unaccounted for in the representative site analysis.

The consumer surplus value as estimated from the Martin, Gum, and Smith (n.d.) data was $63,276,010. This value is $18 million less than the value obtained by projecting the values of the representative sites to the entire Basin. Neither set of estimates as given here include the values of hunting in the Basin and, therefore, underestimate the total value of the resource for its use in outdoor recreation, including hunting. Values for hunting were estimated by Martin, Gum, and Smith and, in the same manner already described, the values for hunting were derived for the Salt-Verde Basin. Appendix Tables 65 and 66 show that for the Salt-Verde Basin the nondiscriminating monopolist value of hunting to be $4,153,537 and the consumer surplus value to be $9,158,868 (summarized in Table 58).

It cannot be determined which of the estimates are "correct," but the fact that the two estimates are as close together as they are, and were partially developed from completely different sets of data, one starting with aggregates and purporting to look at all recreational use, the other starting with a few representative sites and projecting values for these sites to the entire Basin, lends credence to the estimates.

Conclusion

The objectives of determining demand functions and value estimates for representative sites in the Salt-Verde Basin as well as valuing the entire Basin have been accomplished. Knowing the values of these

Forest Lands for recreation use, as well as having values for the other products produced by these Forest Lands could allow the U.S. Forest Service to more efficiently administer this Basin as outlined in the Multiple Use Sustained Yield Act of 1960. It is recognized that economics of recreation research is still in the stage of infancy, and that the estimates presented are merely "ball park estimates." Yet, until more conceptual and empirical work is done, these estimates along with those of Martin, Gum, and Smith (n.d.), Kurtz (1972), and King and Kurtz (1968) are the best available.

One suggestion for empirical improvement would be to increase the number of representative sites so as to better classify the remainder of the sites in the Basin. In particular, the dispersed recreation areas were not adequately represented. It is almost impossible, however, to look at dispersed recreation from the point of view of a site. The aggregate approach of Martin, Gum, and Smith (n.d.) is probably better for analysis of dispersed use.

A conceptual problem that has not been analyzed adequately, is the problem of separating the components of the overall recreational experience. Since the majority of the sampled households found all five components of the "whole recreation experience" enjoyable, it is possible that the estimated demand functions for the representative sites were biased upwards. Although no attempt was made in this study to empirically measure the bias introduced by this conceptual difficulty, some qualitative evidence is developed in Appendix C. Detailed empirical work on this aspect of recreation valuation is recommended for future studies.

APPENDIX A

DATA COLLECTION MATERIAL

Cover Letter and Site Information for Luna Lake

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

COLLEGE OF AGRICULTURE
DEPARTMENT OF AGRICULTURAL ECONOMICS

Dear Outdoorsman:

We want to thank you for taking the time to register at the registration station at the Luna Lake recreation area. You were probably aware while participating in outdoor recreation that our outdoors are becoming more and more crowded. As our population and leisure time increases, so does the competition for the use of our natural resources. You can help to improve the quality of outdoor recreation and preserve our natural environment by taking a few minutes of your time and filling out the enclosed questionnaire.

You were selected on the basis of having stopped and registered at the registration station. Your cooperation in this study is voluntary. Please complete the questionnaire and return it to us in the enclosed self-addressed stamped envelope. Your information will be combined with information from other outdoorsmen who spent time at this recreation site, and will be used only for statistical purposes. The answers that you give will be kept strictly confidential.

We hope you will find recalling your recent visit a pleasant experience. Please answer all the questions; most are easily answered by placing a check next to the answer you select. Some questions also give you an opportunity to voice your opinion about matters which could affect the future management of outdoor recreation areas.

This study is being made in cooperation with the U.S. Forest Service. The data that your answers provide can help them determine how much people use and spend on outdoor recreation. Your response will also help to assure that your recreational needs are considered in future planning.

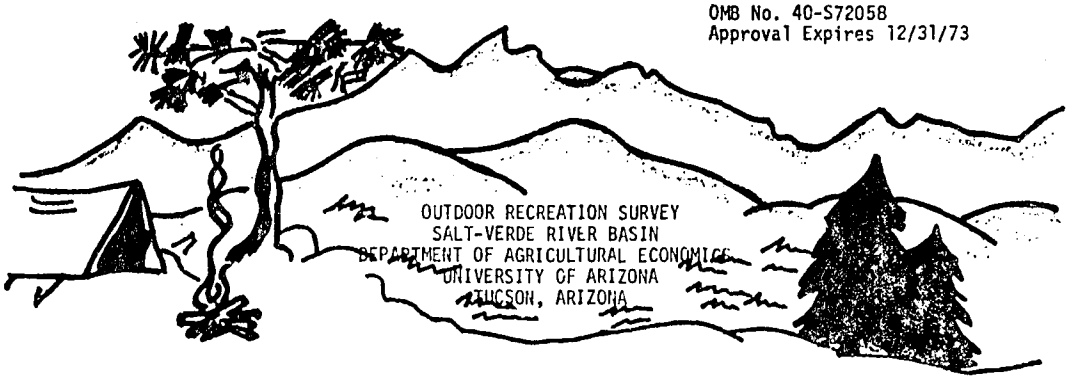
Sincerely,

William E. Martin
Professor

Werner Sublette
Research Associate

pt

Questionnaire



OMB No. 40-S72058
Approval Expires 12/31/73

PART I. Site Information

1. On your most recent visit to Luna Lake, did you enter by way of: (check one)

   ○ (a) U.S. Highway 666 (Coronado Trail)
   ○ (b) State Highway 73 via Pinetop and McNary
   ○ (c) U.S. Highway 60 via Springerville
   ○ (d) State Highway 273 (Alpine-Big Lake road)
   ○ (e) U.S. Highway 180 from New Mexico

2. On your most recent visit to Luna Lake, did you leave by way of: (check one)

   ○ (a) U.S. Highway 666 (Coronado Trail)
   ○ (b) State Highway 73 via Pinetop and McNary
   ○ (c) U.S. Highway 60 via Springerville
   ○ (d) State Highway 273 (Alpine-Big Lake road)
   ○ (e) U.S. Highway 180 from New Mexico

3. Do you agree or disagree with the following statements concerning the Luna Lake recreation area? (please check one for each)

   Agree ○ Disagree ○ (a) The area should be further developed to include more formal picnic places and campgrounds.

   Agree ○ Disagree ○ (b) The number of people in the area at one time should be limited.

OMB No. 40-S72058
Approval Expires 12/31/73

OUTDOOR RECREATION SURVEY
SALT-VERDE RIVER BASIN
DEPARTMENT OF AGRICULTURAL ECONOMICS
UNIVERSITY OF ARIZONA
TUCSON, ARIZONA

The information that you provide for this study is confidential and will be used only in combination with information from other recreationists. Individual respondents will not be identified.

Your name and address is necessary to check in form and prevent sending you a duplicate questionnaire.

1. Your Name?_____

2. Your Address? Street_____

City_____

State_____ ZIP_____

County_____

This sheet will be separated from the rest of the questionnaire before processing and storage to assure anonymity.

Part II. Recreation Costs All of the following questions relate to your trip to the recreation area talked about in the cover letter and on page 1.

1. On your most recent trip to this recreation site, how many days did your trip take? (Include days traveling to and from the recreation site as well as at the site. Count any portion of a day as a full day. Circle One)

   1 2 3 4 5 6 7 8 9 10 11 12 13 14

   More than 14 days

2. For the following questions, please estimate the expenditures that you and your family made specifically in relation to your most recent trip to this recreation site. Include only costs that you and your family incurred specifically in preparation for this one trip. (Make a rough guess if necessary).

   (a) 1. Total food and refreshment costs made on this trip, including liquor. (Include the value of food and drink traveling to and from the site as well as at the site. Also include the value of food and drink taken along from home) . . . . . $_____

   2. Is this more, less, or about the same as you would have spent if you had stayed at home? (Circle one) . . . . more less same

   (b) Lodging costs exclusive of camp fees to and from the site as well as at the site . . . . . $_____

   (c) Additional miles that the car was driven for recreational purposes at or near the recreational site. (Do not include miles traveling to the site and returning home from the site)_____miles

   (d) Cost of bait, lures, boat operating expenses, etc . . . . $_____

   (e) Costs of ammunition . . . . . $_____

   (f) Equipment rental costs:

   (1) boats . . . . . $_____

   (2) motors . . . . . $_____

   (3) trailers . . . . . $_____

   (4) campers . . . . . $_____

   (5) fishing equipment . . . . . $_____

   (6) hunting equipment . . . . . $_____

   (7) camping equipment . . . . . $_____

   (8) other (specify)

   _____ . . . . . $_____

   _____ . . . . . $_____

g. Fees paid

(1) Campground and/or entrance fee . . . . . $_____

(2) Other (specify)_____ . . . . . $_____

(3) _____ . . . . . $_____

h. Costs of licenses, fishing stamps and/or hunting tags (specify) (include only if bought specifically for this one trip.)

(1)_____ . . . . . $_____

(2)_____ . . . . . $_____

(3)_____ . . . . . $_____

i. Other Costs (specify)

(1)_____ . . . . . $_____

(2)_____ . . . . . $_____

(3)_____ . . . . . $_____

(4)_____ . . . . . $_____

(5)_____ . . . . . $_____

(6)_____ . . . . . $_____

3. Are you satisfied or not with this recreation site? Satisfied○ Not satisfied○

(a) What is it that you like most about this site? _____

_____

_____

(b) What if anything do you feel should be done to change the site? _____

_____

_____

_____

4

Part III. Recreation Information:

1. On your most recent trip to this recreation site, what date did you arrive?

_____ (Month and day)

2. If this was your first trip, would you return to this recreation site again? (Check one) Yes ○ No ○

Why_____

_____

3. (a) If this was not your first trip, how many separate trips in the last 12 months have you made to this same recreation site during each of the following 12 months? (Count 12 months back from the date of your most recent trip as written above. Write number of times for each month.)

January	_____	April	_____	July	_____	October	_____
February	_____	May	_____	August	_____	November	_____
March	_____	June	_____	September	_____	December	_____

(b) What was the total number of days that you spent visiting this recreation site during the past 12 months, including your most recent trip? (Count 12 months back from the date of your most recent trip as written above. Count any portion of a day as a full day and include travel time.) (Check one)

○ (a) 1 - 5	○ (d) 16 - 20	○ (g) 31 - 35
○ (b) 6 - 10	○ (e) 21 - 25	○ (h) more than 35
○ (c) 11 - 15	○ (f) 26 - 30	

(c) Had you ever been to this recreation site before 12 months ago? (check one)

Yes ○ No ○

4. How did you first learn of this recreation site? (Check one or more)

○ (a) Friends	○ (e) Discovered it on a map and went there
○ (b) Read about it in a newspaper or magazine	○ (f) Recommended by club or organization
○ (c) Found it while driving around	○ (g) Forest Service information
○ (d) Campground directory	○ (h) Other_____

5. On your most recent trip to this recreation site: (check one)

   ○ (a) Was it the main destination of your trip?

   ○ (b) Was it a stop on the way to some other site or sites? (Please list these sites)

   (1)_____

   (2)_____

   (3)_____

6. (a) On your most recent trip to this recreation site, how many persons were in your group? (Include yourself)_____persons

   (b) How many of them were 11 years old or younger?_____

   (c) How many were not part of your family?_____

   (d) If transportation costs were shared, what proportion did you pay? (For example, 1/2, 1/4, etc.) _____

7. The following are components of any outdoor recreation experience. Check how enjoyable each one of these was to you on your most recent trip to this recreation site. Relate your answers only to a normal trip, exclude any unusual experiences such as accidents and catastrophes. (Make one check for each of the 5 reasons listed.)

Reasons	Very Enjoyable	Enjoyable	Indifferent	Unenjoyable	Very Unenjoyable
1. Planning and anticipation of trip at home.					
2. Travel to the site excluding the anticipated enjoyment at the site.					
3. Experience at the site.					
4. Return trip home itself, excluding recollection of the recreation experience.					
5. Recalling the experience to onself and friends after the trip is over.					

8. The purpose of your trip(s) to this recreation site was: (Check one or more)

- ○ (a) overnight camping
- ○ (b) hiking
- ○ (c) picnicking
- ○ (d) hunting
- ○ (e) fishing
- ○ (f) pleasure driving (sightseeing)
- ○ (g) nature study
- ○ (h) rock hunting
- ○ (i) horseback riding
- ○ (j) off the road traveling
- ○ (k) motorcycling
- ○ (l) photography
- ○ (m) boating
- ○ (n) swimming
- ○ (o) winter sports

Others (specify)

- ○ _____
- ○ _____

9. On your most recent trip, what kind of transportation did you use to get to this recreation site? (Check one or more)

- ○ (a) Private conventional car
- ○ (b) VW type camper
- ○ (c) Self-contained mobile home vehicle
- ○ (d) Pick-up with camper
- ○ (e) Pick-up without camper
- ○ (f) Vehicle with camping trailer
- ○ (g) Four-wheel drive vehicle
- ○ (h) Motorcycle
- ○ (i) Other_____

10. Did you bring any additional transportation equipment to this site on your most recent trip? (Check one or more)

- ○ (a) None
- ○ (b) Boat
- ○ (c) Dune-buggy
- ○ (d) Trail-bike
- ○ (e) Horse or Mule

Others (specify)

- ○ _____
- ○ _____

11. Why did you choose this specific site in which to recreate?

_____

_____

_____

12. The following is a list of reasons some people feel are important in choosing an outdoor recreation site. Please indicate how important each of these factors was in influencing your decision to choose this particular site. (Place one check for each reason.)

Reasons	Very Important	Slightly Important	Not Important
a. Developed roads to the area			
b. Undeveloped roads-trails within area			
c. Few other people			
d. Close to home			
e. Beauty of the area			
f. Good facilities			
g. Undeveloped site			
h. Feeling of remoteness of area			
i. Reasonable cost			
j. Others (specify)			

13. If for some reason this recreation site had been closed during the time in which you planned to visit, and you knew in advance of your trip that it was closed, what alternative recreation sites would you have chosen?

List alternative sites in order of preference. (If none, write none.)

1st_____

2nd_____

3rd_____

14. No changes in fees are being considered but we would like your opinion on the effect that fee changes would have on your use of this site. What would be the highest single entrance fee per vehicle that you would pay before going elsewhere?

(a) Assuming that all facilities and conditions on the site would remain exactly the same as on your most recent trip.

(b) Assuming that the fees were used for improving the facilities and conditions on the site.

(c) Assuming that the fees would discourage others from using the site but facilities would remain as before.

(In the following table, check the highest fee you would pay before going elsewhere for each of the above mentioned conditions.)

Fee	If there were no changes in conditions or facilities	If fees were used to improve conditions or facilities	If fees would discourage others from utilizing site
Would pay up to:			
Over $10.00			
$10.00			
$ 9.00			
$ 8.00			
$ 7.00			
$ 6.00			
$ 5.00			
$ 4.00			
$ 3.00			
$ 2.00			
$ 1.50			
$ 1.00			
$ .50			
Would not pay any fee			

Part IV. General Information

In order to combine your replies with other persons like you, we need the following additional information for the person to whom this questionnaire was addressed.

1. (a) What is your age? _____ years

   (b) What is your sex? Male ○ Female ○

   (c) What is your race?

   ○ Negro or black ○ Oriental

   ○ White, except Spanish-American ○ American Indian

   ○ Spanish-American ○ Other (specify)_____

2. How many grades of school have you completed? (Circle highest grade completed)

   Elementary 1 2 3 4 5 6 7 8

   High School 1 2 3 4

   College 1 2 3 4

   Post Graduate or other special schools attended (specify and state number of years)

   _____

   _____

3. During your childhood years, how actively did you participate in outdoor recreation. (Check one)

   ○ (a) Very ○ (c) Seldom

   ○ (b) Moderately ○ (d) Not at all

4. Where did you live during most of your childhood? (Check one for yourself and one for spouse if applicable)

	Yourself	Spouse
(a) On a farm		
(b) Rural area		
(c) City under 10,000 population		
(d) City with populatien 10,000-24,999		
(e) City with population 25,000-99,999		
(f) City with population 100,000-249,999		
(g) City with population 250,000-999,999		
(h) City with population over 1 million		

5. Occupation:

   (a) Are you a student? Yes ⬭ No ⬭

   (b) If employed, what sort of work do you do? _____

   (c) If unemployed, what sort of work do you normally do? _____

   (d) If retired, what sort of work did you do? _____

6. (a) Are you married? Yes ⬭ No ⬭

   (b) If yes, does your spouse work Yes ⬭ No ⬭

   (c) What type of work _____

7. What are the ages and sex of members of your household? (Include yourself)

Members of Household	Age	Sex	Relationship to Head of Household
Head of Household (a)			xxxx
(b)			
(c)			
(d)			
(e)			
(f)			
(g)			
(h)			

8. Approximately how much total income before taxes did you have during the past year? (Include all members of your household.) (Please check one)

   ⬭ Less than $3,000
   ⬭ $3,000 - $5,999
   ⬭ $6,000 - $7,999
   ⬭ $8,000 - $9,999
   ⬭ $10,000 - $11,999
   ⬭ $12,000 - $14,999
   ⬭ $15,000 - $19,999
   ⬭ $20,000 - $24,999
   ⬭ $25,000 - $34,999
   ⬭ $35,000 and over

9. (a) If you are employed and have a regular work week, what days do you normally have off? (Please check each day you have off)

○ Monday	○ Thursday	○ Saturday
○ Tuesday	○ Friday	○ Sunday
○ Wednesday		

(b) 1. If you are employed but do not have a regular work week, how many days off per month do you have? _____ days per month

2. How many of these days fall together? _____days

3. Do these days usually fall on the weekend? Yes○ No ○

10. Do you receive a paid vacation? Yes ○ No ○

If yes, how many days? _____days

11. What time(s) of the year do you normally take your vacation? (Check one or more for all or part of a month.)

○ January	○ May	○ September
○ February	○ June	○ October
○ March	○ July	○ November
○ April	○ August	○ December

12

Part V. Outdoor Activities

In addition to the information already supplied, we would appreciate you filling in the following table and thereby helping us to learn more about peoples' leisure time patterns. Please make checks for each leisure activity listed.

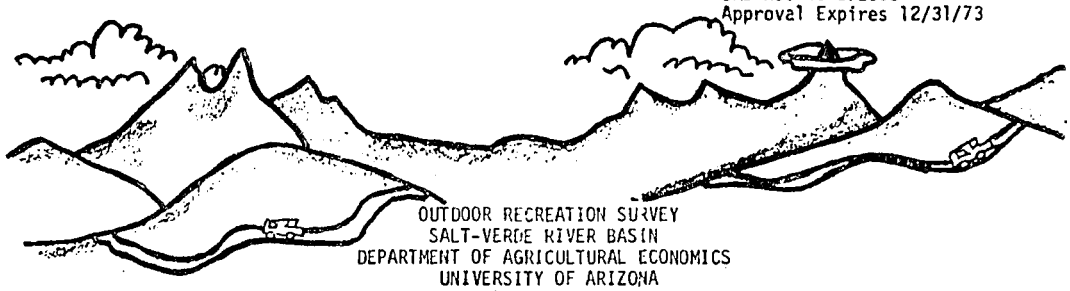
(a) how often you did each of the listed activities in the past 12 months.
(b) during what times of the year you did these activities.
(c) how you felt about participating in these activities.

Outdoor Activities	How often last year (check one)			When (check one or more)			Your Reaction (check one)				
	Frequently	Occasionally	Never	During normal work week	Weekend or holiday	During longer vacation period	Would like to do it more often	Satisfied with frequency	Would like to do less often	Would like to do	Not interested
1. Fishing											
2. Hunting											
3. Gardening-yard work											
4. Camping-overnight											
5. Picnicking											
6. Hiking-backpacking											
7. Outdoor swimming											
8. Boating-canoeing											
9. Waterskiing											
10. Outdoor plays, concerts, lectures											
11. Walking for pleasure											
12. Spectator sports											
13. Organized sports											
14. Playing tennis											
15. Playing golf											
16. Trail bike riding											
17. Pleasure driving sightseeing											
18. Motorcycling											
19. Bicycling											
20. Nature walking											
21. Photography											
22. Dune buggy riding											
23. Horseback riding											
24. Skiing											
25. Others (List)											

THANK YOU FOR YOUR COOPERATION. PLEASE RETURN QUESTIONNAIRE IN THE ENCLOSED STAMPED ENVELOPE PROVIDED.

Site Information for Other Sites

OMB No. 40-S72058
Approval Expires 12/31/73



OUTDOOR RECREATION SURVEY
SALT-VERDE RIVER BASIN
DEPARTMENT OF AGRICULTURAL ECONOMICS
UNIVERSITY OF ARIZONA
TUCSON, ARIZONA

PART I. Site Information

1. On your most recent trip to the Horsethief Basin recreation area, did you enter by way of: (check one)

   ○ (a) the road from Prescott via Groom Creek
   ○ (b) the road through Cordes
   ○ (c) the road through Bumblebee

2. On your most recent trip to the Horsethief Basin recreation area, did you leave by way of: (check one)

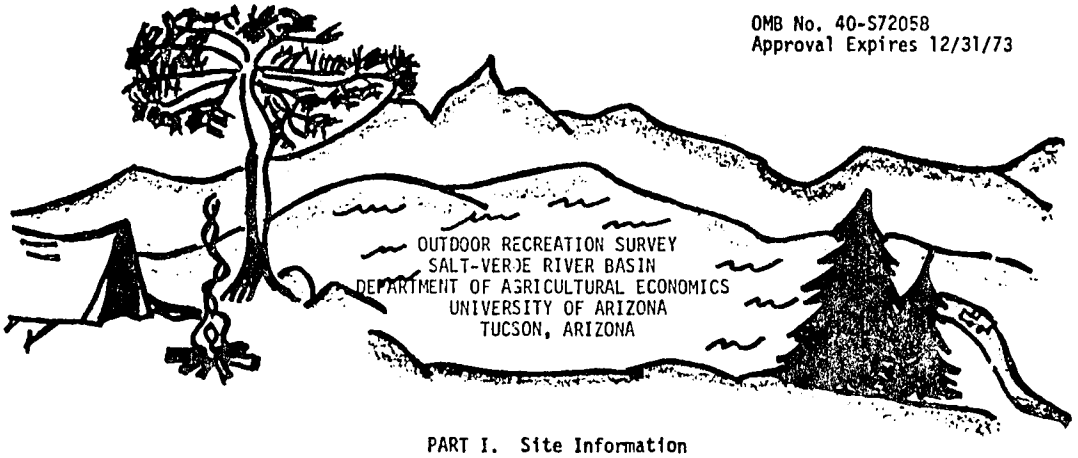
   ○ (a) the road from Prescott via Groom Creek
   ○ (b) the road through Cordes
   ○ (c) the road through Bumblebee

3. Do you agree or disagree with the following statements concerning the Horsethief Basin recreation area? (please check one for each)

   Agree ○ Disagree ○ (a) The area should be further developed to include more formal picnic places and campgrounds.

   Agree ○ Disagree ○ (b) The road into the area should be improved.

   Agree ○ Disagree ○ (c) The number of people in the area should be limited.



OMB No. 40-S72058
Approval Expires 12/31/73

PART I. Site Information

1. On your most recent trip to Knoll Lake, did you enter by way of: (check one)

   ○ (a) State Route 87 from Winslow
   ○ (b) Old Rim Road
   ○ (c) Leonard Canyon Road via Happy Jack and Blue Ridge Ranger Station

2. On your most recent trip to Knoll Lake, did you leave by way of: (check one)

   ○ (a) State Route 87 from Winslow
   ○ (b) Old Rim Road
   ○ (c) Leonard Canyon Road via Happy Jack and Blue Ridge Ranger Station

3. Do you agree or disagree with the following statements concerning the Knoll Lake recreation area? (please check one for each)

   Agree ○ Disagree ○ (a) The area should be further developed to include more formal campgrounds and picnic areas.

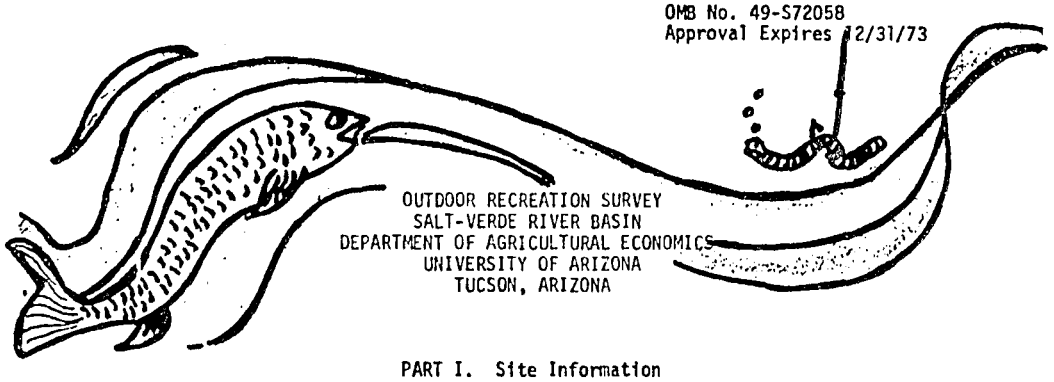
   Agree ○ Disagree ○ (b) The road should be paved.

   Agree ○ Disagree ○ (c) The number of people in the area at one time should be limited.

   Agree ○ Disagree ○ (d) Improved trails for day hikers and backpackers should be established.

   Agree ○ Disagree ○ (e) It would be desirable to have service facilities with groceries, boat rentals, and bait and tackle.

OMB No. 49-S72058
Approval Expires 12/31/73



OUTDOOR RECREATION SURVEY
SALT-VERDE RIVER BASIN
DEPARTMENT OF AGRICULTURAL ECONOMICS
UNIVERSITY OF ARIZONA
TUCSON, ARIZONA

PART I. Site Information

1. On your most recent trip to Black Canyon Lake, did you enter by way of: (check one)

   ○ (a) State Highway 260
   ○ (b) Old Rim Road

2. On your most recent trip to Black Canyon Lake, did you leave by way of: (check one)

   ○ (a) State Highway 260
   ○ (b) Old Rim Road

3. Do you agree or disagree with the following statements concerning the Black Canyon Lake recreation area? (please check one for each)

   Agree ○ Disagree ○ (a) The area should be opened to overnight camping.

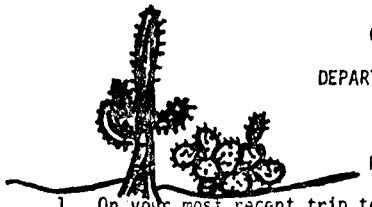
   Agree ○ Disagree ○ (b) The area should be developed to include improvements in camping facilities.

   Agree ○ Disagree ○ (c) The number of people in the area at one time should be limited.

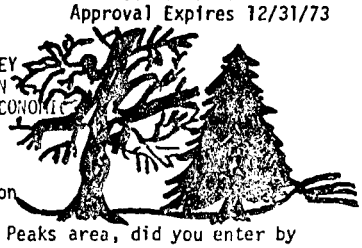
   Agree ○ Disagree ○ (d) The roads leading into the area should be improved.

   Agree ○ Disagree ○ (e) Improved trails for day hikers and backpackers should be established.

OMB No. 40-S72058
Approval Expires 12/31/73



OUTDOOR RECREATION SURVEY
SALT-VERDE RIVER BASIN
DEPARTMENT OF AGRICULTURAL ECONOMICS
UNIVERSITY OF ARIZONA
TUCSON, ARIZONA



PART I. Site Information

1. On your most recent trip to the Brushy Basin-Four Peaks area, did you enter by way of: (check one)

   ○ (a) The Beeline Highway (State Route 87)
   ○ (b) The Roosevelt Lake Road (State Routes 88 & 188)

2. On your most recent trip to the Brushy Basin-Four Peaks area, did you leave by way of: (check one)

   ○ (a) The Beeline Highway (State Route 87)
   ○ (b) The Roosevelt Lake Road (State Routes 88 & 188)

3. On your most recent recreation trip to the Brushy Basin-Four Peaks area, where did you go? (check one)

   ○ (a) The higher elevations (Ponderosa Pine-Four Peaks area)
   ○ (b) The lower elevations (Brushy Basin-Desert areas)
   ○ (c) Both of the above

4. Were you aware that part of this area has been treated to convert it from chaparral-type vegetation to grasslands through burning and defoliating?

   Yes ○ No ○

   If you answered yes, what do you feel have been the effects of this conversion? (Check those for which you have an opinion.)

   a. ○ (1) Better fire control ○ (2) Worse fire control
   b. ○ (1) Improved landscape ○ (2) Destroyed landscape
   c. ○ (1) More and better grazing ○ (2) Less and worse grazing
   d. ○ (1) More water yield ○ (2) Less water yield
   e. ○ (1) Increased wildlife ○ (2) Decreased wildlife
   f. ○ (1) Easier to get through ○ (2) Harder to get through

5. Do you agree or disagree with the following statements concerning the Brushy Basin-Four Peaks area? (Check one for each)

   Agree ○ Disagree ○ (a) The area should be more fully developed to include formal picnic places and campgrounds.

   Agree ○ Disagree ○ (b) The road into the area should be improved.

   Agree ○ Disagree ○ (c) The number of people in the area at one time should be limited.

   Agree ○ Disagree ○ (d) The conversion treatment from chaparral to grasslands was a scenic improvement.

   Agree ○ Disagree ○ (e) Periodic treatment should be used to keep the area in its present state.

   Agree ○ Disagree ○ (f) The conversion treatment should be expanded to a larger area.

   Agree ○ Disagree ○ (g) The area should have been left alone in its natural state as chapparel.

Follow-up Letter

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

COLLEGE OF AGRICULTURE
DEPARTMENT OF AGRICULTURAL ECONOMICS

Dear Outdoorsman:

Several days ago you received a questionnaire from us relating to the value and future needs of outdoor recreation for Arizona.

If you have already completed and returned this questionnaire, we thank you for your cooperation. The information that you are providing can help us to determine how much people use and spend on outdoor recreation. This information will be extremely valuable in planning for Arizona's future recreational needs.

If you have not yet completed the questionnaire, we sincerely hope that you can do so in the very near future. Your cooperation is vitally needed.

Thank you very much.

Sincerely,

William E. Martin
Professor

Werner Sublette
Research Associate

WEM:WS/pt

Brief Description of Questionnaire

The mail interview questionnaire was color-coded by sections in order to attain a higher response rate from the sampled visitors. Each of the sections is briefly discussed below.

Cover Letter

The same cover letter was used for each of the five areas with the exception that the particular area to be discussed was specified in the letter.

Name and Address Page (goldenrod page)

The respondent's name and place of residence was required to determine who had responded, and where the place or origin of the recreator was. Place of origin was absolutely necessary in order to compute distance traveled to the recreation site (and thus, transportation costs). The ZIP code made it possible to pinpoint origin more accurately, an important consideration for recreation sites such as Brushy Basin which are near a major metropolitan area.

Page 1 - Information about attitudes toward a specific area (white page)

This page was designed to elicit information about the specific recreation area to be discussed by the respondent. A different but similar page was designed for each of the other four areas to be studied.

Two pages of expenditure information (pink pages)

This section contains the basis of the surrogate price variable, crucial to the Clawson-Hotelling approach to recreation demand analysis.

These are the variable costs which are the most important variables in the regression equation relating the quantity of activity to its demand determinants.

Four pages of recreation information
(green pages)

The first part of this section was devoted to establishing total activity at the specific site in the twelve months previous to the respondent's last visit and to ascertain if it was a first or a repeat visit. Unless it was a repeat visit or the respondent would consider going again, his expenses may not even be equal to the satisfaction gained. It was also necessary to establish at this point whether the site in question was in fact the destination of the trip. If it was not, it would be improper to allocate all trip expenses to the demand for this particular site.

This section also determined the size of the group involved (only the trip leader will have registered at the voluntary registration booths), whether it was a family group or not, and how transportation expenses were shared. The latter question was especially important in computing trip transportation cost per household.

The last part of this section was the first attempt in any recreation study to measure the satisfaction gained or lost in each component of the recreation experience. Estimated demand functions will be unbiased only if the experience at the site was enjoyable, and the recreator was indifferent to all other components of the experience. For example, if travel to the site is unenjoyable, estimated demand for the site will be biased downward.

Three pages of general information
(yellow pages)

The socioeconomic information of this section was used for two purposes. First, the question on age, number of children, years of education, and income (continuous variables) are relative to determinants of demand necessary as shifter variables in the regression analysis to be used for statistical demand estimation. The other, non-continuous socioeconomic variables, were combined with the continuous variables to describe the population relative to its interests, participation and expenditure in the various types of recreational activities.

Leisure time patterns (blue page)

This page is an attempt to show how people who have actually recreated in the National Forests spend most of their leisure time.

APPENDIX B

MAPS AND KEYS TO PLACES OF ORIGIN

Table 59. Key to Counties of Origin of Households in the State of Arizona.[a]

Key	County
1	Mohave
2	Yuma
3	Coconino
4	Yavapai
5	Gila
6	Pinal
7	Pima
8	Santa Cruz
9	Cochise
10	Graham
11	Greenlee
12	Navajo
13	Apache
14	Maricopa

[a]See Figure 12 for Map of Counties.

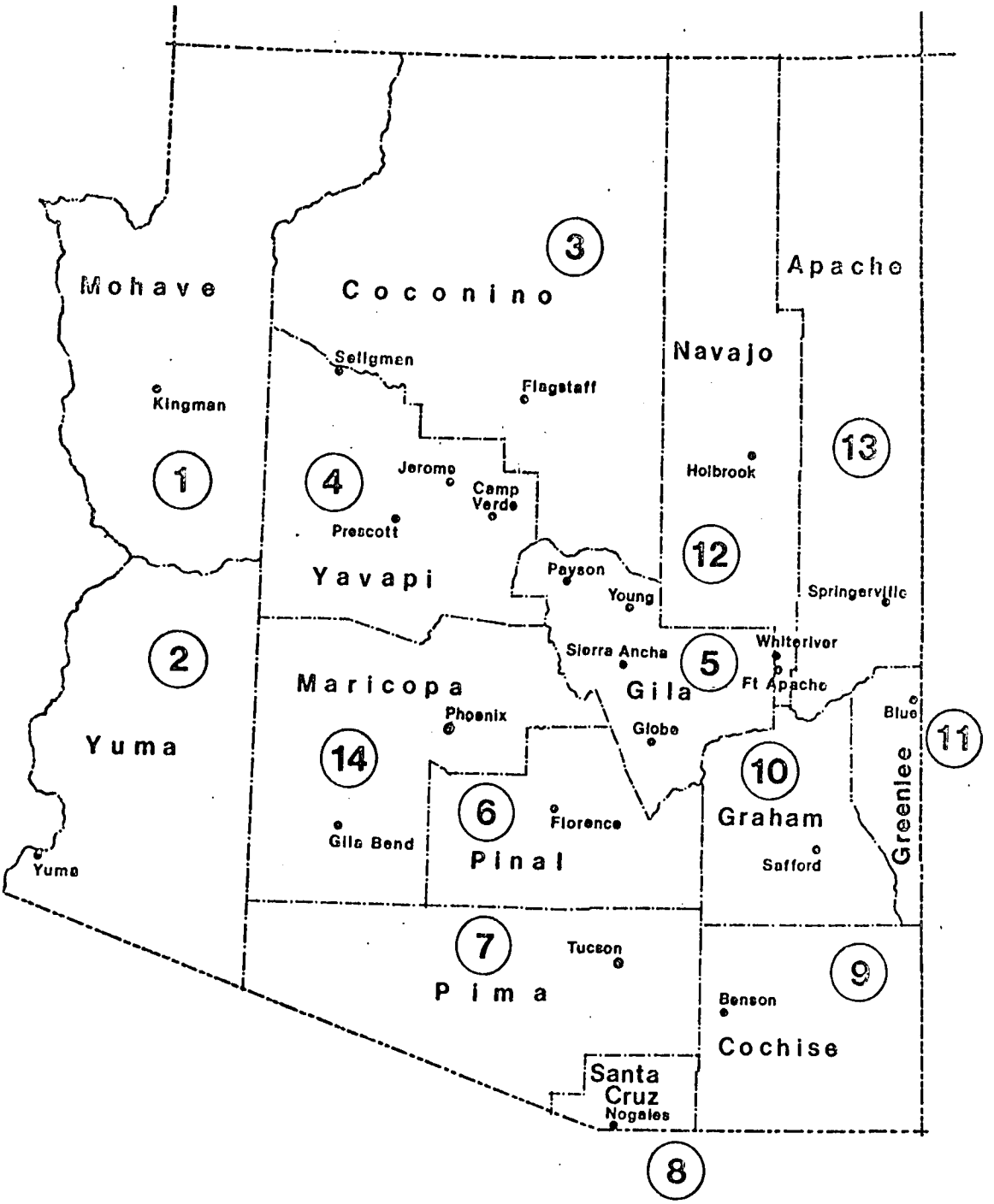


Figure 12. Map of the Counties in Arizona.

Table 60. Key to Places of Origin of Households in Maricopa County.[a]

Key	Place of Origin
15	Phoenix - Northeast
16	Phoenix - Northwest
17	Phoenix - West Central
18	Phoenix - East Central
19	Phoenix - Southeast
20	Phoenix - Southwest
21	Scottsdale
22	Mesa
23	Tempe
24	Avondale
25	Buckeye
26	Cashion
27	Chandler
28	El Mirage
29	Gila Bend
30	Gilbert
31	Glendale
32	Goodyear
33	Paradise Valley
34	Peoria
35	Sun City
36	Surprise
37	Tolleson
38	Wickenburg
39	Youngtown

[a]See Figures 13 and 14 for a map of places of origin.

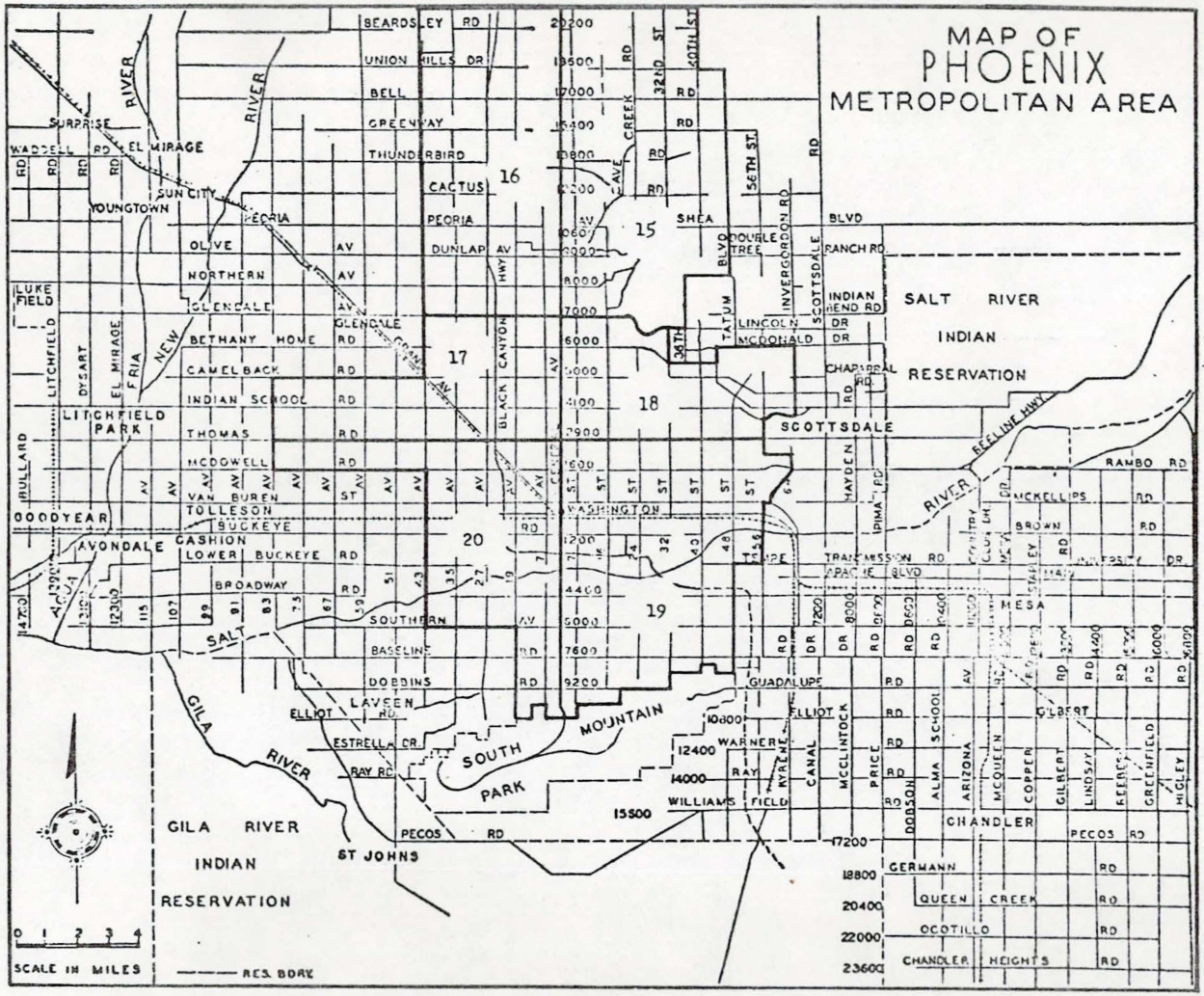


Figure 13. Map of Phoenix Division of Places of Origin of Households.

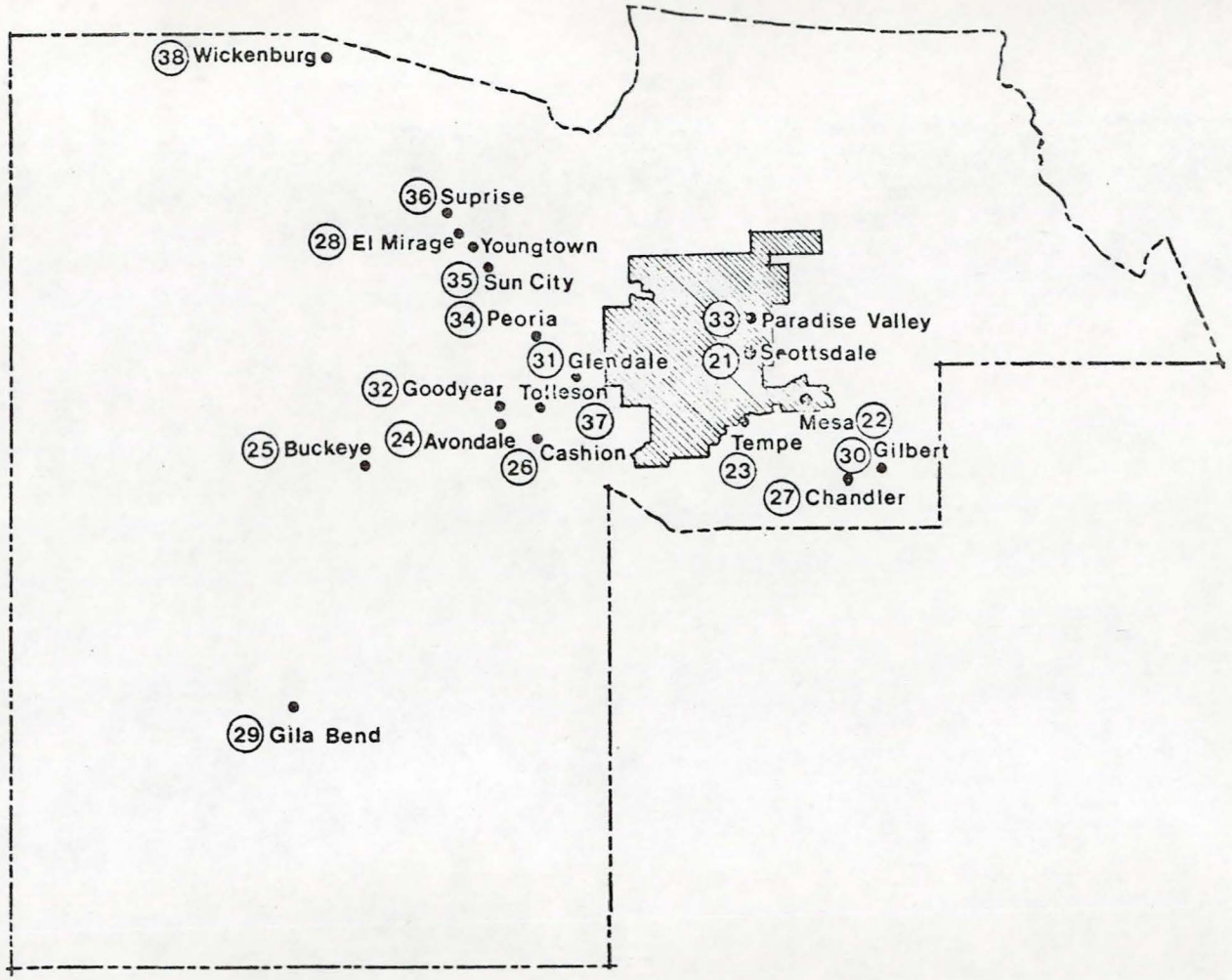


Figure 14. Map of Maricopa County and Places of Origin of Households.

APPENDIX C

CLASSIFICATIONS OF SITES AND TABLES FOR VALUING THE TOTAL BASIN

Table 61. Classification of Developed Sites in the Salt-Verde Basin[a] and Their Total Value, 1972.

	Representative Sites and Their Values				
	Luna Lake	Black Canyon Lake	Knoll Lake	Horsethief Basin	Total
Nondiscriminating Monopolist Value	$ 483,322	$270,591	$338,414	$338,414	$ 27,549
Consumer Surplus Value	$1,117,539	$772,413	$861,750	$861,750	$125,609

Big Lake[d]	South Fork	Diamond Rock	Alpine Divide
Luna Lake	Benny Creek	Lakeview	Clint's Well
Lynx Lake	Greer	Pinegrove	Horsethief Basin
Hill Top[b]	Sheep Crossing	Ashurst	Kehl Springs
Lakeside[b]	West Fork	Forked Pine	Clear Creek
Woods Canyon Lake	Warren Springs	Dairy Springs	Beaver Creek
	P.S. Point	Kinnikinick	Manzanita
	Beaver Dam	Blue Ridge	Pine Flat Trailer
	Hall	Rock Crossing	Thumb Butte[b]
	Aspen	Knoll Lake	White Spur
	Elderberry	Cave Springs	Upper Wolf Creek
	Nelson Reservoir	Pine Flat	Lower Wolf Creek
	Jackson Springs	Granite Basin	Indian Creek
	Hannagan	Chevelon Lake	Potato Patch
	Cienaga	Christopher Creek	The Playground
	Stray Horse	Tonto Creek	Mingus Mountain
	Honeymoon	Ponderosa	Powel Springs
	Red Rock		Gentry
	Chavez Crossing		Canyon Point[c]
	Halfway Point		Midsley Bridge
	Banjo Bill		Encinoso
	Slide Rock		Lower Manzanita
	Woodland Reservoir		Sycamore
	Fool Hollow		Pine

Table 61. Continued

	Representative Sites and Their Values				
	Luna Lake	Black Canyon Lake	Knoll Lake	Horsethief Basin	Total
		Black Canyon Rim Black Canyon Lake Willow Springs Lake Bear Canyon Lake Chevelon Crossing			
Nondiscriminating Monopolist Value	$ 5,799,864	$ 7,847,139	$ 6,091,452	$ 771,372	$20,509,827
Consumer Surplus Value	$13,410,468	$22,399,977	$15,511,500	$3,517,052	$54,838,997

[a]United States Department of Agriculture, Forest Service (n.d.).

[b]Two times the value of the representative site.

[c]Three times the value of the representative site.

[d]Four times the value of the representative site.

Table 62. Nondiscriminating Monopolist Value and Consumer Surplus Value of Portions of the Fort Apache Indian Reservation and the San Carlos Indian Reservation within the Salt-Verde Basin, 1972.[a]

Type of Recreation	Nondiscriminating Monopolist Value ($)	Consumer Surplus Value ($)
General Rural Outdoor Recreation	4,722,248	7,736,168
Cold Water Fishing	2,875,451	4,748,489
Warm Water Fishing	357,647	671,733
TOTAL	7,955,346	13,156,390

Source: Martin, Gum and Smith (n.d.).

[a]Data inflated from 1970 to 1972. Reservations are within the Salt-Verde Basin outside of National Forest boundaries and within Arizona Game and Fish Management Regions 5 and 7. See Figure 11 for Region and Basin boundaries.

Table 63. Nondiscriminating Monopolist Value of Portions of the Arizona Game and Fish Management Regions within the Salt-Verde Basin, 1972.[a]

Region	General Rural Outdoor Recreation ($)	Cold Water Fishing ($)	Warm Water Fishing ($)	Total ($)
1	5,278,050	3,466,216	204,796	8,949,062
2	8,978,015	737,991	112,250	9,828,256
3	399,070	138,814	643,049	1,180,933
5	9,000,037	200,036	7,357,875	16,557,948
7	499,808	102,308	193,811	795,927
TOTAL	24,154,980	4,645,365	8,511,781	37,312,126

Source: Martin, Gum and Smith (n.d.).

[a]Data inflated from 1970 to 1972. See Figure 11 for Region and Basin boundaries.

Table 64. Consumer Surplus Value of Portions of the Arizona Game and Fish Management Regions within the Salt-Verde Basin, 1972.[a]

Region	General Rural Outdoor Recreation ($)	Cold Water Fishing ($)	Warm Water Fishing ($)	Total ($)
1	8,383,701	5,738,558	348,695	14,470,954
2	15,221,026	1,367,129	181,127	16,769,282
3	665,655	221,429	902,456	1,789,540
5	15,528,911	471,636	11,666,061	27,666,608
7	1,029,207	157,642	392,777	1,579,626
TOTAL	41,828,500	7,956,394	13,491,116	63,276,010

Source: Martin, Gum and Smith (n.d.)

[a]Data inflated from 1970 to 1972. See Figure 11 for Region and Basin boundaries.

Table 65. Nondiscriminating Monopolist Value for Hunting of Portions of the Arizona Game and Fish Management Regions within the Salt-Verde Basin, 1972.[a]

Region	Deer Hunting ($)	Other Big Game Hunting ($)	Small Game Hunting ($)	Water Fowl Hunting ($)	General Hunting ($)	Total ($)
1	93,723	130,761	12,313	6,541	12,935	256,273
2	390,702	126,813	58,657	3,029	5,302	584,503
3	21,717		12,242		970	34,929
5	85,586	655,116	2,108,344		63,803	2,912,849
7	136,406	19,719	191,728	8,579	8,551	364,983
TOTAL	728,134	932,409	2,383,284	18,149	91,561	4,153,537

Source: Martin, Gum and Smith (n.d.)

[a]Data inflated from 1970 to 1972. See Figure 11 for Region and Basin boundaries.

Table 66. Consumer Surplus Value for Hunting of Portions of the Arizona Game and Fish Management Regions within the Salt-Verde Basin, 1972.[a]

Region	Deer Hunting ($)	Other Big Game Hunting ($)	Small Game Hunting ($)	Water Fowl Hunting ($)	General Hunting ($)	Total ($)
1	201,503	513,128	28,250	14,132	26,034	783,047
2	1,417,044	282,954	139,740	7,689	13,376	1,860,803
3	48,988	6,080	23,909	5,461	2,837	87,275
5	280,322	1,149,165	3,805,057	41,554	192,731	5,468,829
7	348,265	50,386	375,744	20,701	163,818	958,914
TOTAL	2,296,122	2,001,713	4,372,700	89,537	398,796	9,158,868

Source: Martin, Gum and Smith (n.d.)

[a]Data inflated from 1970 to 1972. See Figure 11 for Region and Basin boundaries.

APPENDIX D

VISITOR RESPONSE TO COMPONENTS OF THE WHOLE RECREATION EXPERIENCE

According to Clawson (Clawson and Knetsch, 1966) the concept of the use of a recreation site is but one part of the "whole recreation experience." He maintains that the following five phases are present in every major outdoor recreation activity:

1. Anticipation and preparation for the trip
2. Travel to the site
3. The actual on-site experience
4. Travel back home from the site
5. Recollection of the experience

Thus, when estimating demand functions and measuring the value of the recreation resource, one must consider that the whole recreation experience includes more than just the experience at the site. To derive a truly unbiased estimate of the demand function for a recreation experience, a recreator would have to enjoy the experience at the site, the anticipation and recollection of the experience at the site itself, and be indifferent to all other components of the whole recreation experience. For example, if one of the other components such as travel to the site is enjoyable, the estimated demand function for the site itself will be biased upward.

An attempt was made in this study to ascertain whether satisfaction was gained or lost in each component of the recreation experience

by asking visitors to a site whether they enjoyed, were indifferent to, or disliked any part of the whole recreation experience. In answering these questions, recreators were asked to exclude any unusual experiences such as accidents that would bias their answers.

Tables 67 through 71 are the responses by the sampled recreators to the components of the whole recreation experience.

Almost 88 percent of the respondents from Luna Lake indicated that planning and anticipation of the trip was enjoyable. This is the highest response of all the sites and this may be due to the greater distance that this site is away from the major population centers as compared to the other sites. Brushy Basin-Four Peaks, which is closest of all the sites to the Phoenix metropolitan area has the lowest percent (88) of respondents indicating that planning and anticipation of the trip was enjoyable. Usually very little planning is required on a one-day outing such as the ones normally undertaken when visiting Brushy Basin-Four Peaks.

Almost 92 percent of the sampled recreators at Luna Lake indicated that travel to the site was enjoyable. This again is the highest response of all the respondents of the selected sites and seems to reflect that the greater the distance and the better the road conditions are, the more enjoyable travel is. Horsethief Basin, a site very close to the Phoenix metropolitan area had the lowest percent of respondents (76) indicating that travel to the site was enjoyable. This may be the result of the treacherous and dusty 30 miles of unpaved road that must be traversed prior to reaching the site.

Table 67. Visitor Response to Components of the Whole Recreation Experience at Luna Lake, 1972.

Responses- Percent of Households	Components of Recreation Experience				
	Planning and Anticipation	Travel to Site	Experience at Site	Return Travel	Recollection of Experience
Enjoyable	87.6	91.8	90.9	82.3	90.7
Indifferent	11.1	6.9	6.0	12.4	8.0
Unenjoyable	1.3	1.3	3.1	5.3	1.3
TOTAL	100.0	100.0	100.0	100.0	100.0

Table 68. Visitor Response to Components of the Whole Recreation Experience at Black Canyon Lake, 1972.

Responses- Percent of Households	Components of Recreation Experience				
	Planning and Anticipation	Travel to Site	Experience at Site	Return Travel	Recollection of Experience
Enjoyable	81.4	86.7	90.8	75.8	85.5
Indifferent	18.1	11.1	6.1	17.8	12.5
Unenjoyable	.5	2.2	3.1	6.4	2.0
TOTAL	100.0	100.0	100.0	100.0	100.0

Table 69. Visitor Response to Components of the Whole Recreation Experience at Knoll Lake, 1972.

Responses- Percent of Households	Components of Recreation Experience				
	Planning and Anticipation	Travel to Site	Experience at Site	Return Travel	Recollection of Experience
Enjoyable	86.1	87.8	92.9	73.4	88.4
Indifferent	12.7	8.6	3.5	17.4	9.8
Unenjoyable	1.2	3.6	3.6	9.2	1.8
TOTAL	100.0	100.0	100.0	100.0	100.0

Table 70. Visitor Response to Components of the Whole Recreation Experience at Horsethief Basin, 1972.

Responses- Percent of Households	Components of Recreation Experience				
	Planning and Anticipation	Travel to Site	Experience at Site	Return Travel	Recollection of Experience
Enjoyable	85.3	76.1	94.5	68.8	89.1
Indifferent	13.3	10.9	3.8	15.7	9.2
Unenjoyable	1.4	13.0	1.7	15.7	1.7
TOTAL	100.0	100.0	100.0	100.0	100.0

Table 71. Visitor Response to Components of the Whole Recreation Experience at Brushy Basin-Four Peaks, 1972.

Responses-Percent of Households	Components of Recreation Experience				
	Planning and Anticipation	Travel to Site	Experience at Site	Return Travel	Recollection of Experience
Enjoyable	80.3	88.1	97.0	77.7	93.0
Indifferent	19.4	10.8	1.9	17.5	6.7
Unenjoyable	.3	1.1	1.1	4.8	.3
TOTAL	100.0	100.0	100.0	100.0	100.0

Response to an enjoyable on-site experience was highest at Brushy Basin-Four Peaks. About 97 percent of the registrants indicated that they enjoyed the recreation experience. Slightly over 3 percent of the visitors to Luna Lake, Black Canyon Lake, and Knoll Lake indicated that the on-site experience was unenjoyable. Much of this feeling was attributed to overcrowding at the site.

Over 82 percent of the visitors to Luna Lake indicated that the return trip was enjoyable. Only 68 percent of the households visiting Horsethief Basin stated that they enjoyed the return travel. Again the hazardous road conditions at Horsethief Basin are probably the reason for this type of response. In fact, almost 16 percent of the households indicated that return travel was unenjoyable. A lower percentage of visitors to each of the five sites stated the return trip was enjoyable than said that travel to the site was enjoyable.

Households visiting Luna Lake and Brushy Basin-Four Peaks responded highest to enjoying the recall of the recreation experience. Almost 91 percent of the households visiting Luna Lake and 93 percent of those visiting Brushy Basin-Four Peaks enjoyed recalling the recreation experience. The lowest percent of sampled households (85) indicating they enjoyed the recall of the recreation experience was recorded for Black Canyon Lake.

From the sampled households at all the sites, it is quite evident that the majority of the households found all five components of the whole recreation experience enjoyable. These results lead to the conclusion that the estimated demand functions for all five of the selected representative sites are biased upwards and therefore the

estimated resource values may be too high. One might make a qualitative judgment that the value at Luna Lake might be the most overestimated. The percentage of respondents enjoying the travel to the site was the highest, and enjoyment of the site itself was about the lowest. Thus, for many, it was the trip itself that was important and the households might not respond as projected to an increase in fee at the specific site.

One could posit that the estimated values for Horsethief Basin might be the least overestimated. Travel to and from the site is unenjoyable or at least not enjoyable for 23.9 percent and 31.4 percent of the households, respectively. If a person returns to Horsethief Basin, he really must enjoy the site itself.

No attempt was made to empirically measure the bias introduced into estimating the demand functions when components of the recreation experience other than the on-site experience and the anticipation and recall of the site itself were either enjoyable or unenjoyable. This aspect of recreation valuation has not been treated empirically by any author and is recommended for future studies.

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